AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

AUGUST, 1958

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Precision Metal Molding

PMM

INCLUDING DIE CASTINGS MAGAZINE

DISTILLED WRITING

DIE CASTINGS

INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

POWDER METALLURGY

SHELL MOLD CASTINGS

"Powdered iron parts reduce breakage and cut costs in the Megger instrument"
— Fred E. Lombard, The James G. Biddle Co.

see page 3

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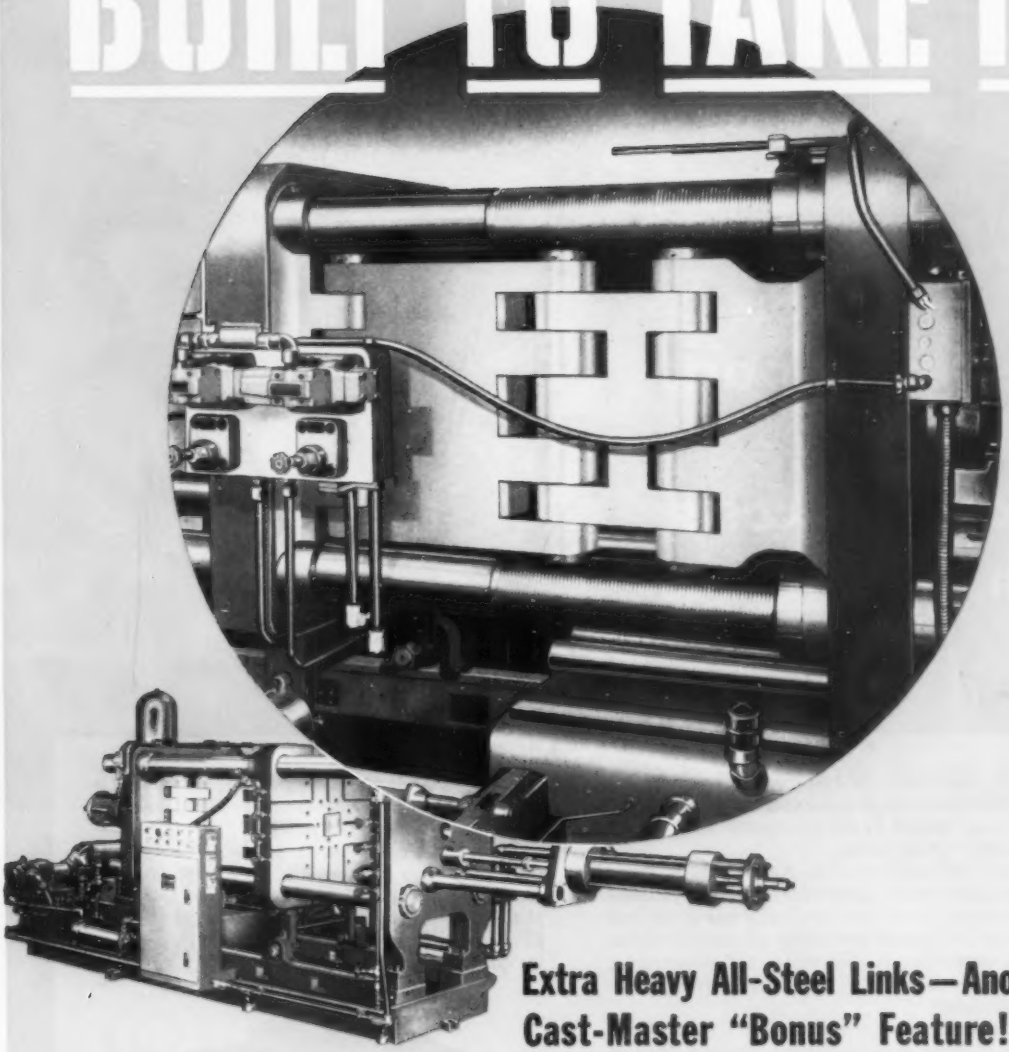

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The story of Cast-Master quality is a story of "bonus" features — like the link system shown here. Cast-Master links are super-rugged — all-steel — machined — with wide spread for positive lock-up, and multiple shear points to eliminate link pin breakage. Result? — more precision — lower maintenance costs for Cast-Master owners. To get the complete "bonus" story, send for the new Cast-Master catalog.

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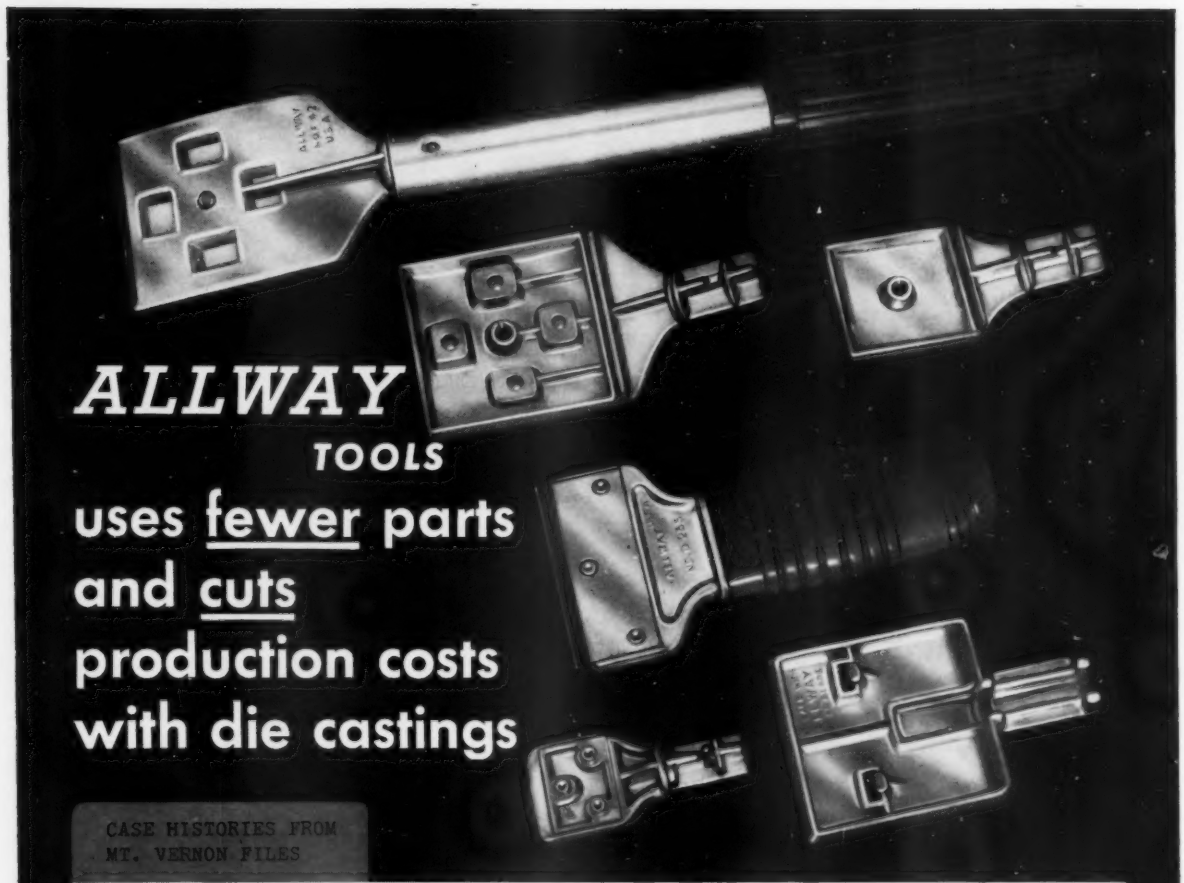

ALLWAY TOOLS uses fewer parts and cuts production costs with die castings

CASE HISTORIES FROM MT. VERNON FILES

"We set out to make the best looking–best performing–best priced line of woodscrapers on the market. Die casting helped us do it", reports Mr. Gringer, President, *Allway Tools.

There's no doubt about it–Allway 4 Edge Wood Scrapers for fine and rough work, and Allway Finishing Scrapers for fine work are easily one of the best designed and easiest performing scrapers available. And a vital factor in their design and manufacture has been the full use of all the inherent advantages of zinc die casting.

Each blade mount is a light-weight, rigid, ribbed casting of great strength. Allway Scrapers have to withstand lots of hard pressure without bending or cracking.

All design requirements, mounting bosses, correct curvature for effective blade angle, clean edges and finish, high production rate, were economically achieved. In addition to their quality design and construction, Allway Scrapers have to be competitively priced.

Allway takes the zinc die castings as they come in – drills and taps a hole or swages a rivet stud as required in each model – firmly stakes a steel handle to it – adds blade and vinyl grip, and the scraper is ready for market. Result – simplified, fast, low-cost production and a superior product.

When you are confronted with problems of lower production costs or product improvement, consider die casting and bring your problem to us. Our complete four-fold service will help provide the answers. Contact your nearest Mt. Vernon sales representative for quick action.

*Allway Manufacturing Co., N. Y. C.

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STAMFORD, CONNECTICUT

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IN THIS ISSUE

August 1958: Volume 16 Number 8

COVER

COST CUTS OF 50% came to the James G. Biddle Co. in Philadelphia, manufacturers of the Megger, when they stopped using a material in their magnets which gave the parts a breakage rate as high as 25%.

These breaks came during fabrication, were accepted as a matter of course, and written off as an unavoidable loss.

Then the company's engineers tried sinterings. Results were amazing. High-breakage stopped, and production-time was cut.

Some of the men responsible are, left to right: Fred Lombard, design engineer and author of the article "Stop Magnet Breaks by Switching to Sinterings"; Edward Pettit, machine shop foreman; Paul Nowak, methods engineer; and Ted Rights, design engineer. For details turn to page 19.

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One-piece investment casting replaces a group of stampings and screw machine parts on a business machine.

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HYDRAULIC SAFETY BULLETIN

IMPROVED FIRE-RESISTANT UCON HYDROLUBES QUICKLY, EASILY INSTALLED IN HYDRAULIC SYSTEMS

Standard flushing and refilling procedures are sufficient for Ucon hydrolube safety hydraulic fluids.

Most hydraulic systems can be quickly and easily converted to fire-resistant Ucon hydrolubes from flammable petroleum oils or synthetic fluids. Actual experience, in hundreds of industrial installations, shows that standard flushing and refilling procedures, involving a minimum of time and effort, are sufficient.

Installation Procedure

The procedure generally followed in converting to Ucon hydrolubes from petroleum hydraulic fluids is:

1. Drain the petroleum oil from the system and remove residual sludge and deposit.
2. Flush the system with Ucon hydrolube.
3. Install a clean filter and replace any worn pump parts and deteriorated gaskets, seals, or packings. Repair leaking pipe joints.
4. Operate at reduced pressure to insure proper lubrication of the hydraulic pump; then, bring the system up to standard operating conditions.

Experience also shows that, once installed, Ucon hydrolubes require a minimum of maintenance because the tendency to creep through pipe fittings and along pump shafts and cylinder rods is often significantly less than with other types of fluids.

FIRST FEW WEEKS IMPORTANT

During the first few weeks of operation, filters and inlet screens may sometimes become clogged by sludge and other unwanted deposits loosened by the solvent action of the hydrolube. Since stoppage may cause pump starvation and cavitation, noisy operation, and high pump wear, filter cartridges should be replaced and inlet screens cleaned as often as needed.

When replacing non-aqueous, fire-resistant fluids with Ucon hydrolubes care should be taken to remove all of the previous fluid from the hydraulic system. This can best be done by draining the non-aqueous fluid from the system, flushing with a petroleum hydraulic oil and then following the installation procedure previously outlined.

FIRE-RESISTANCE PROVED BY TESTS

The common fire hazards connected with hydraulic operations are eliminated when Ucon hydrolubes are used. This has been proved by tests and more than 10 years of routine use in industrial hydraulic equipment. Ucon hydrolubes are approved by Factory Mutual Laboratories.

Get all the facts on Ucon hydrolubes. Write for the booklet, "Ucon Hydrolubes Spell Safety." Address . . . Department B.

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DIVISION OF UNION CARBIDE CORPORATION

30 E. 42nd Street, New York 17, New York

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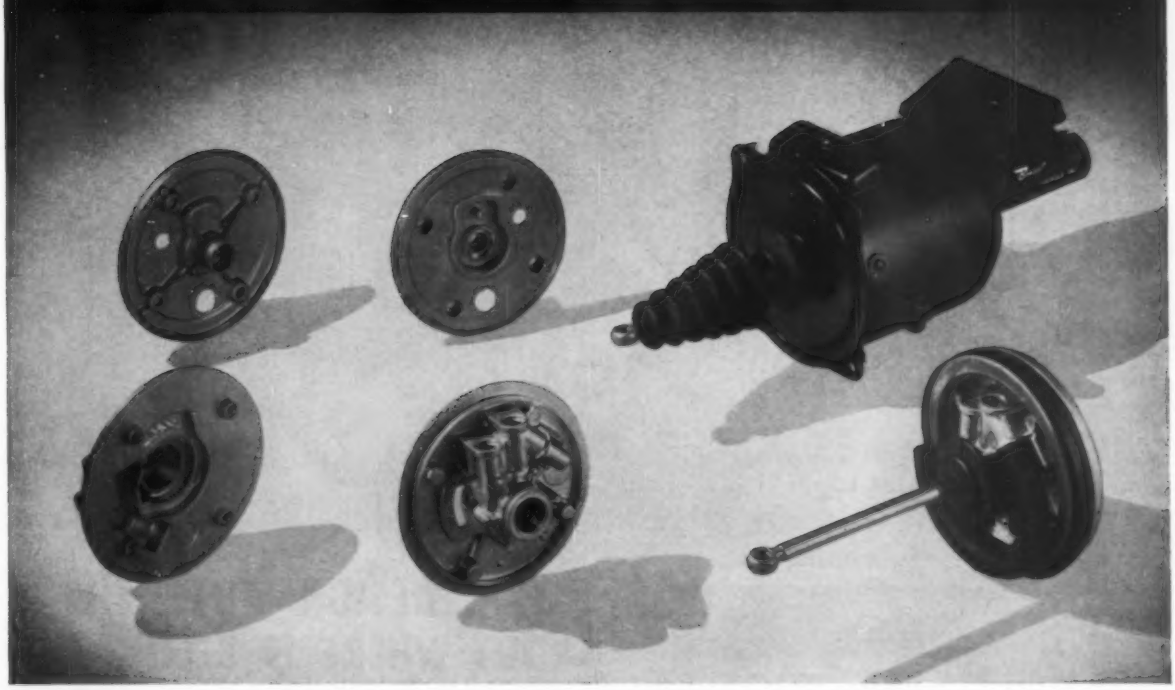
FOR *Eliminating Extra Parts* AND *Extra Machining*

ZINC DIE CASTINGS ARE BEST



Bendix engineers designed this piston and control valve assembly for the Treadle-Vac Power Brake so the entire mechanism could be built around these two intricate ZINC Die Castings.

Extra parts—as well as extra machining—were eliminated by the use of ZINC Die Castings.

Front and back views of the two castings show the cored holes and bosses used in locating and fitting the internal parts. Both plates are quickly prepared for assembly by a single machining operation and locked together as a unit containing the poppet valves, springs, diaphragms and other necessary equipment.

Bendix engineers gained additional advantages by using ZINC Die Castings. Ribbing, for instance, permitted the use of metal-saving thin wall sections while providing more than ample strength for the job. They knew, from previous experience, that die life is longer with ZINC than with other die casting materials.

Why not see your die caster and find out how such parts-saving and time-saving advantages can be used in your products?

HORSE HEAD SPECIAL ZINC AND HORSE HEAD ZAMAK ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

DEVELOPERS OF THE MODERN ZINC DIE CASTING ALLOYS IN USE TODAY

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HORSE HEAD PRODUCTS ®

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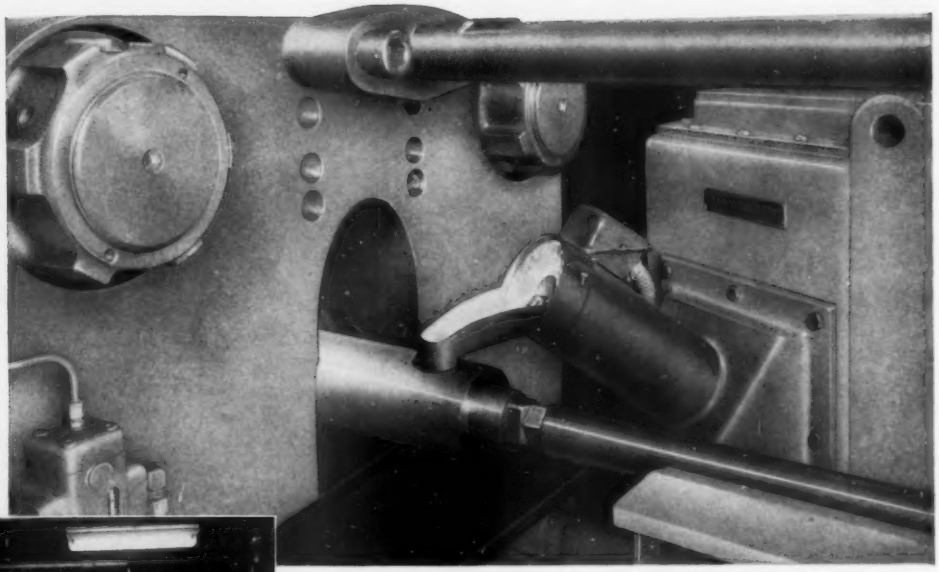
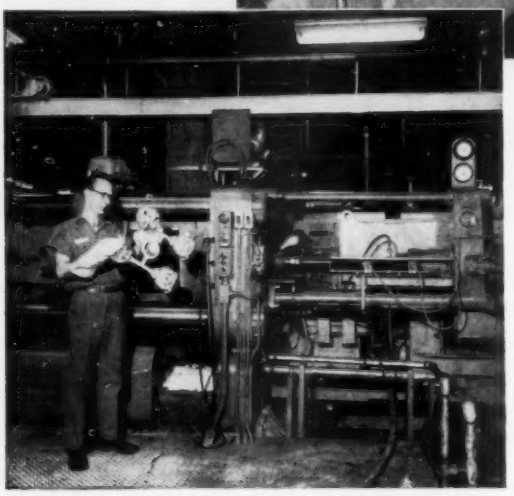
DIE CASTERS ideal for automatic ladling



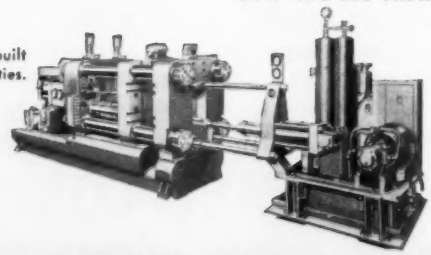
A 4-cavity end bracket gate being die cast on an H-P-M 600-ton machine at Century Electric Co., St. Louis. A 5 lb. shot on a 20 sec. continuous cycle.



H-P-M DESIGN PUTS THE SPOUT WHERE IT BELONGS

Automating the time-consuming chore of ladling metal into the metal well relieves the operator of a hot and fatiguing operation and increases total shots per hour. The above close-up of an H-P-M 600-ton machine at Century Electric Co. shows that H-P-M's design allows the furnace spout to be placed where it must be for successful operation. This is just one of many improvements incorporated in H-P-M die casting machines that result in better, faster, low-cost production. Century Electric, a 100% H-P-M die casting operation, has used H-P-M's for casting motor rotors, end brackets and other parts for years. Let us send you the facts on H-P-M's line of heavy duty die casting machines. Write today.

H-P-M Cold chamber machines are built in 200, 400, 600 and 800 ton capacities.



H819

THE HYDRAULIC PRESS MFG. COMPANY

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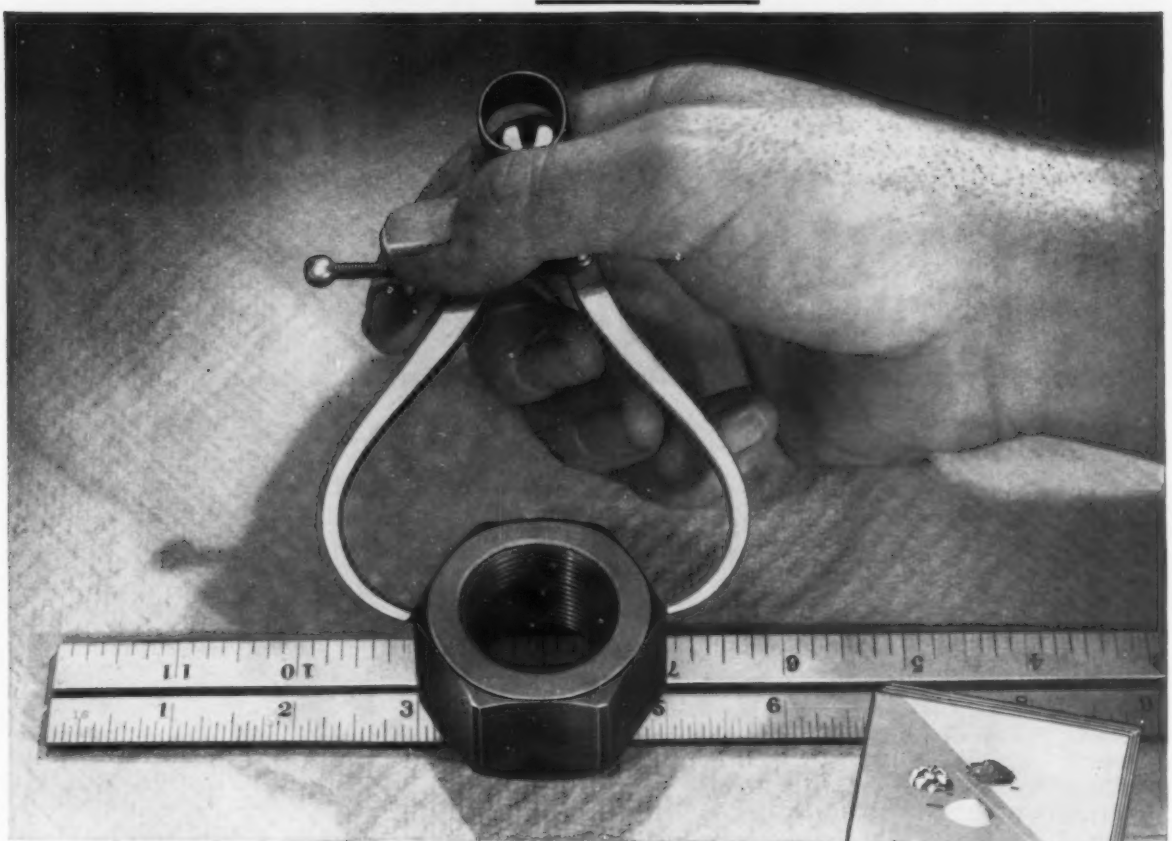
For BIG SIZE *performance*

WAKEFIELD BEARING CO. specified HOEGANAES powders preblended to their specifications



Outside dimensions, 2-inches—and in tomorrow's powder metallurgy terminolgy, that's BIG SIZE performance for products like this.

But—a problem preceded this performance. Formerly, Mr. Wills M. Tate, Wakefield Bearing Company Plant Engineer, ran into troubles of inconsistent batch-to-batch powder blends.

Then, he called in the Hoeganaes Engineering Specialist to work with them and cooperate towards a solution. And the solution was a practical one . . . it ended with Hoeganaes custom-blending. Not only was a storage problem (of *several* former powders) eliminated, but more importantly, *their present blends have consistent properties from batch-to-batch.*

Write for literature and information regarding the Hoeganaes Test-Bar-Service . . . how it can lead to *your* practical solution to blend problems.

Just off the press. Write for your copy of this fact-filled 12-page brochure that could be your introduction to powder metallurgy benefits in your metal parts production.

HSIC

HOEGANAES SPONGE IRON CORPORATION

HOEGANAES

RIVERTON, NEW JERSEY

SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Los Angeles, Minneapolis, New England (Elmira, N.Y.), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis

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Simplified, low cost COLD CHAMBER VACUUM DIE CASTING INTRODUCED ON LESTER MACHINES BY NEW ENGLAND DIE CASTING CO.

"Dramatic improvement on toughest aluminum job in my memory...rejects were cut to 2% immediately on installation."

It's finally been done! Here is a vacuum die casting system for use on Lester die casting machines, which is not only less expensive, simpler and more practical, but is also a *full-time* 26 inch system...it not only evacuates the air from the die and the cold chamber, but also the gases from the hot die lubricant, while the shot is being made.

The credit for this system belongs to Mr. Charles W. Ohse, President of New England Die Casting Company. With great imagination, born of his years of experience in the industry and unusual competence in running tough die casting applications, Mr. Ohse developed the technique, the apparatus, and the vacuum pumping system at a material cost of about $1,500!

Lester engineers and service men, working in collaboration with Mr. Ohse, developed the timing and synchronization of the plunger movement so that the plunger stops in a forward position to seal off the pouring opening while the vacuum system takes effect.

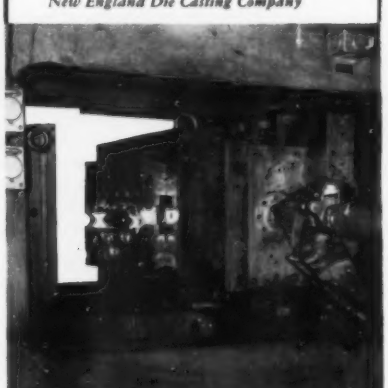
The system permits either hand ladling or automatic ladling from conventional automatic ladling furnaces and allows the use of standard cold chambers and plungers. Standard dies can be readily adapted to the process at nominal cost.

A notable example of the results achieved by this system operating on Lester machines is the part shown here. It is a communications cable splice housing which is assembled to form a weather-proof, leak-proof unit capable of permanently withstanding internal nitrogen gas pressures of 15 psi and test air pressures of 25 psi. Mr. Ohse has die cast the job for years. After introduction of his vacuum die casting system, the rejects dropped to *one out of fifty* and the weight of the shot increased by 3 ounces! The system is now operative on one battery of 5 machines in the New England Die Casting plant.

We invite you to write today to find out how Lester equipment can help you to make higher quality die castings.

LESTER-PHOENIX, INC.
2708-A CHURCH AVENUE • CLEVELAND 13, OHIO
Agents in principal cities throughout the world

MR. CHARLES W. OHSE
President
New England Die Casting Company



• Vacuum system works *inside* die. Trapped air and vaporized gases are drawn through ejector box via 2-1/2" gate valve.

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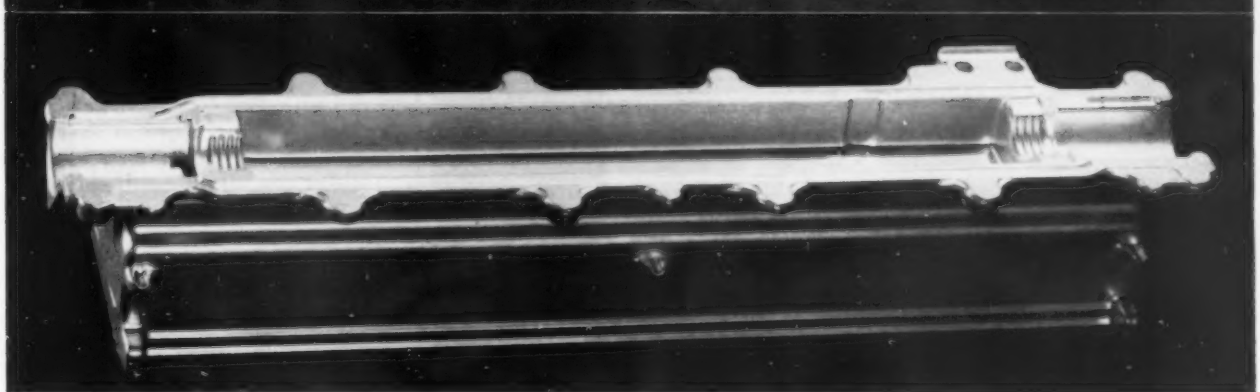

- Combination terminal and splice for telephone cable (produced for Western Electric). Weight formerly was 2.540 lbs. Weight after vacuum was introduced is 2.700 lbs.

System is timed so that plunger advances to seal off pouring port, vacuum exhausts air and gases, and *then* shot is made with usual force and speed.

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Investment casting eliminates costly machining of this Hipernik® magnetic alloy component.

complete facilities for investment casting... speed development... cut costs

At the Westinghouse Metals Plant in Blairsville, Pa., complete facilities for investment casting now produce startling results in cutting your costs of development. Skilled personnel will design, engineer and produce parts to your specifications. You avoid heavy capital investment.

Intricate and complicated shapes in a variety of alloys are produced as a single piece through cost-saving investment casting. After complete physical testing, your part ships ready for production assembly. Final machining can be done at Blairsville.

Whether your needs are for prototype or production quantities, you can get fast, dependable service from Westinghouse. Find out today how investment casting can help you. Write: Westinghouse Electric Corporation, Materials Manufacturing Department, Blairsville, Pa.

J-05008

YOU CAN BE SURE... IF IT'S Westinghouse

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PMM LETTERS

the readers' forum

PLYSHELL PROCESS

I found your article in the June issue on investment casting in Europe most interesting and would like to obtain detailed information on the Plyshell process.—J.L.D.

Further information on this particular process must come from France. However, several similar processes have been developed in this country.—Ed.

VACUUM DIE CASTING

We would appreciate receiving a copy of the article on improved diecasting operations which appeared in the June issue of your magazine. This article also included diagrams.—D.L.S., market research.

Vacuum die casting is still one of the hottest, and most controversial subjects in the industry. Almost every day we learn of another company that has installed their own, or one of the commercially available, vacuum die casting systems. The process is rapidly finding its level of usefulness. As knowledge and experience with vacuum are gained it appears probable that many castings now considered impossible or castings that have a high foundry reject rate will be made easily and inexpensively.—Ed.

ANOTHER DIRECTORY?

We have received your magazine and noted that in the January issue you had a Die Casting Directory and in the June issue, an Investment Casting Directory.

Either you have not published or I missed that copy of your magazine listing a Permanent Mold Directory. We are looking for a source for permanent mold castings and are wondering if you could give us the names of such foundries in a radius of approximately 200 miles of Dubuque, Iowa. Any information you can give us will be greatly appreciated.—R.A.E., purchasing agent.

We do not publish a directory of Permanent Mold Foundries. The names of some local foundries have been forwarded to this reader.—Ed.

ANOTHER INDUCTO INSTALLATION...

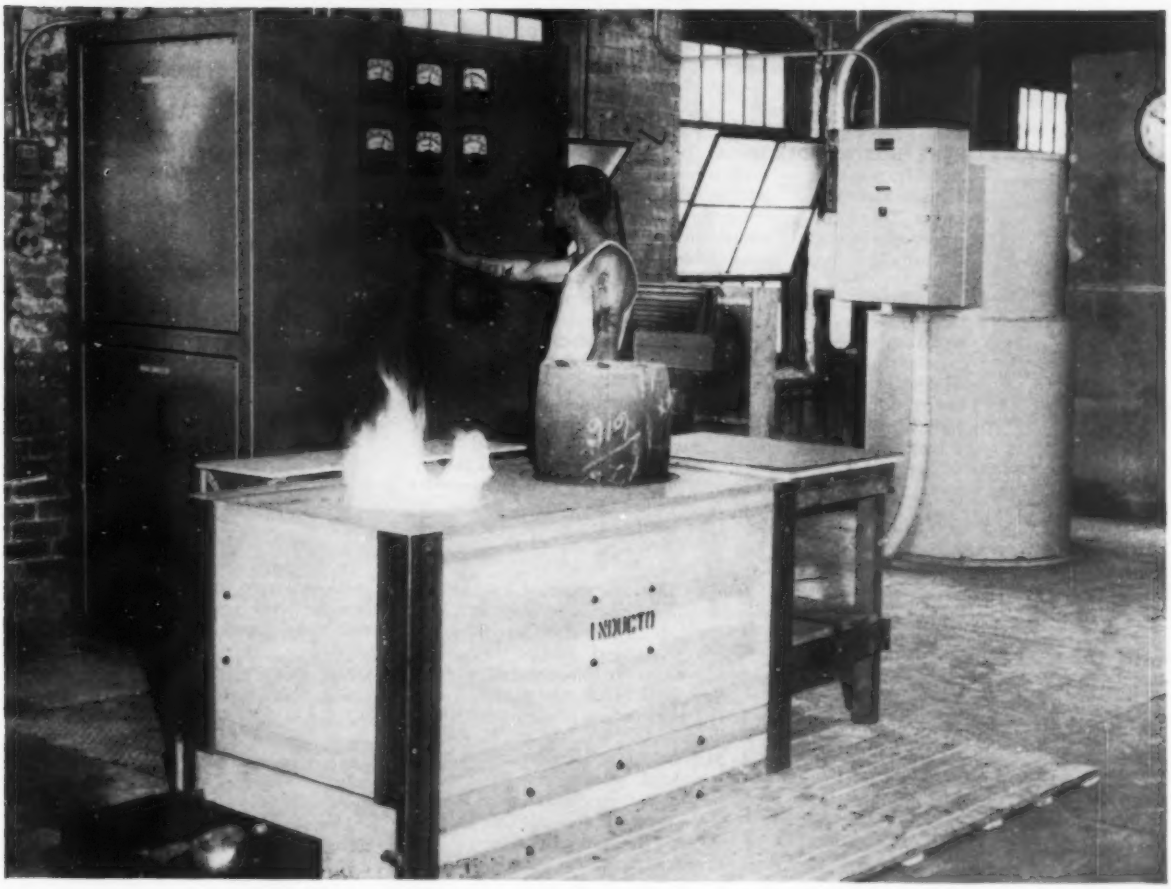

PHOTO COURTESY OF BUSHINGS, INC., PHILA. 32, PA.

The Foundry and the Feather Duster

Shortly after Bushings Incorporated, a Philadelphia manufacturer of cast bronze bushings and bearings, replaced four oil-fired furnaces with an INDUCTO Push-Out induction furnace, the management received a strange request . . . the foundrymen wanted a feather duster. They liked the INDUCTO furnace and control so much, and were so pleased with the cooler and cleaner foundry, that they wanted a feather duster to keep the equipment clean.

And the management was pleased too! For in addition to happier and more productive employees, they gained other benefits. The higher melting speeds and precision control of the INDUCTO Push-Out furnace helped reduce metal losses. In addition, it became possible to reclaim metal from melts and machining. Production time was saved in the handling of crucibles and the transferring of melts. In fact, the one INDUCTO Push-Out furnace provided as many melts in six hours as the four oil-fired furnaces did in eight.

Why not learn for yourself how INDUCTO furnaces and precision control can help modernize your foundry and save production dollars? Write today for more complete details.

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corporation

412 Illinois Ave. Delance, N. J.

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CASTING ABOUT

technical news of applications & processes involving precision metal moldings

MOLYBDENUM MAY BE THE NEXT WONDER METAL, if the promise that new coating methods holds out is realized, Dr. H. W. Schultze of the Climax Molybdenum Div. of American Metal Climax, Inc. believes.

Dr. H. W. Schultze

Despite the many advances in producing and fabricating molybdenum, there are many applications where it is economically or technically impractical to use the solid metal. Vapor deposited coatings, however, make it possible to take advantage of molybdenum's corrosion resistance, wear resistance, and high strength at elevated temperatures and, at the same time, to secure the benefits from the material on which the coating is deposited.

The two most promising deposition methods are the hydrogen reduction of molybdenum pentachloride and the thermal decomposition of molybdenum hexacarbonyl.

The hydrogen reduction of the pentachloride gives films that are completely dense and have well developed grain structures. The metal in the film is very pure and the reaction product (hydrogen chloride) is easily removed by a suitable pumping system. Reduction takes place at about 850°C (1562°F).

Thermal decomposition of the carbonyl has the advantage of lower operating temperatures, 350°C (662°F) and the ability to deposit either pure molybdenum or molybdneum carbide. This system requires closer control and engineering than a hydrogen reduction system, but the carbon monoxide evolved by the decomposition can be recycled so that there is no large material waste.

New applications of the metal mean a greater demand and wider market. The future looks good for molybdenum.

DISSOLVED GASES AND decomposable metal oxides can be removed or greatly lessened if the metal is poured at reduced pressures. Known as vacuum stream degassing, this method of metal refinement is becoming more and more widely used in industry.

Wrought stock rolled from ingots that have been vacuum stream degassed have superior mechanical and physical properties. While the method can improve almost any metal or alloy, it is particularly well adapted to improvement of specialty steels, especially those containing highly reactive metals as minor alloying agents.

One of the latest installations of this process will be in the plant of Standard Steel Works Div. of Baldwin-Lima-Hamilton Corp. The unit is to be built by the Vacuum Equipment Div. of F. J. Stokes Corp.

It will have two vacuum chambers, each capable of a 15 ton pour into an ingot mold. Alloy melting for the stream degassing will be in a 15 ton electric furnace.

Benefits that are reported by users of vacuum stream degassing units are:

1. Hydrogen content of less than 1 p.p.m. on most alloys.
2. Superior surface finish when compared to air cast ingots.
3. Oxygen content of the metal reduced 20% to 30%.
4. Mechanical properties improved. A Nickel-molybdenum-vanadium forging had an elongation of 20%, a reduction in area of 53%. Tests were on un-aged parts.
5. Freedom from flake sensitivity on commercial grade parts.

LEASING OF CAPITAL equipment is gaining favor despite the current dip in capital spending. During the first four months of 1958, the gain in leasing, according to the United States Leasing Corp., was 14% over the same period in 1957.

Among the ten leading manufacturing industries in leasing equipment are fabricated metal products; electrical equipment and machinery; and aircraft and parts. All types of equipment are leased, but the major group is the machine tool and metal forming machinery.

MORE THAN A BILLION pounds of aluminum will be used every year when the automobile industry converts to aluminum engine blocks. The current trend to lighter, more economical cars can only be answered by the aluminum engine.

Despite some production problems that remain to be solved and the high retooling costs that are involved, the car of the near future will have an aluminum engine.

General Motors Corp. has fully tested three V-8, aluminum engines both in the laboratory and in the field. The tests are reported as highly successful.

According to the Reynolds Metals Co., the use of aluminum in passenger cars has increased over 400% in the past few years and is continuing to rise. Based on technological progress and new concepts of design the rate of growth in the use of aluminum will materially increase.

STAINLESS STEEL CASTINGS ARE BEING USED IN INCREASING NUMBERS in high temperature, high pressure power generating equipment. This is becoming even more evident as nuclear power equipment is becoming more and more used.

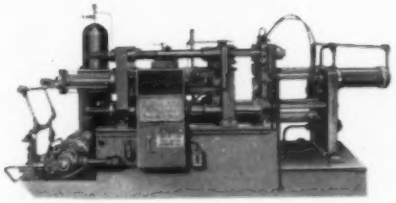
This was brought out at a recent meeting of the producers and users of high alloy castings at the Heat and Corrosion Resistant Alloy Castings Conference held by the International Nickel Co. at their Harbor Island Test Station.

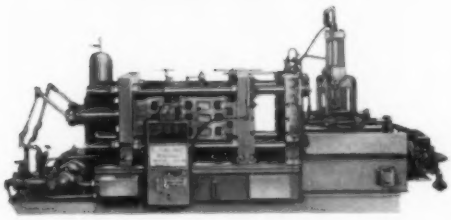
Confused specifications and unjustified restrictions are some of the "gripes" that producers and users aired at the conference. While the need and justification of X-ray inspection was readily admitted, the restrictions on surface finish, for example, place such a burden on the foundries that the price of high alloy castings becomes highly unrealistic. In fact, some of these specifications are effectively retarding the development of more efficient power plants.

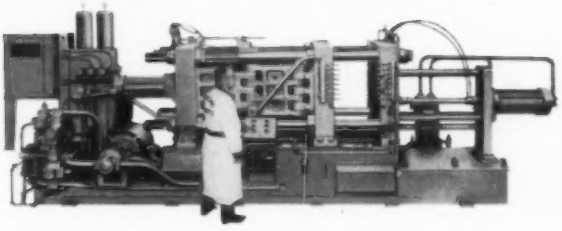
The cast stainless steel elbow is for a nuclear power reactor. It is for a 16" line and is cast in ACI type CF-4 steel. This steel has a high temperature yield strength 20% higher than required by the code of unfired pressure vessels.

It can be seen in the picture at the left. The machine-operator is finishing the elbow's inside diameter.

Extreme accuracy is needed to prepare the stainless steel part.







50

200

400

500

650

800

adds up to 1000

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50-ton locking pressure*
Max. weight of shot, 2.6 lbs. alum.; 5.4 lbs. zinc

Model 200 Cleveland
200-ton locking pressure*
Max. weight of shot, 4.9 lbs. alum.; 12.5 lbs. zinc

Model 400-N Cleveland
400-ton locking pressure*
Max. weight of shot, 9.6 lbs. alum.; 14.5 lbs. zinc

Model 500-N Cleveland
500-ton locking pressure*
Max. weight of shot, 9.6 lbs. alum.; 14.5 lbs. zinc

Model 650 Cleveland
650-ton locking pressure*
Max. weight of shot, 10.6 lbs. alum.; 25.8 lbs. zinc

Model 800 Cleveland
800-ton locking pressure*
Max. weight of shot, 20.1 lbs. alum.; 47.6 lbs. zinc

Model 1000 Cleveland
for Aluminum
1000-ton locking pressure*
Max. weight of shot, 25.5 lbs.

*Locking pressure strain gage tested.

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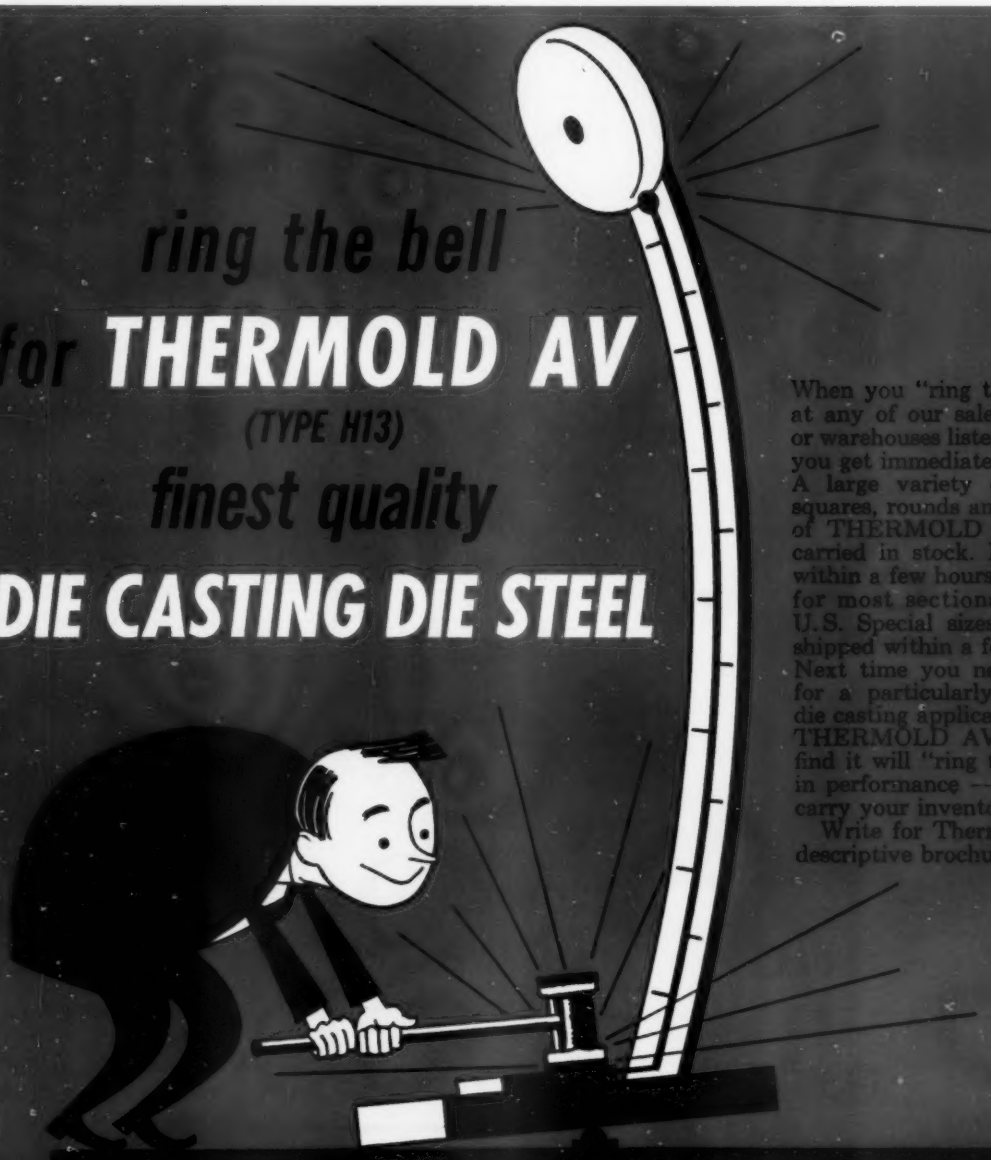

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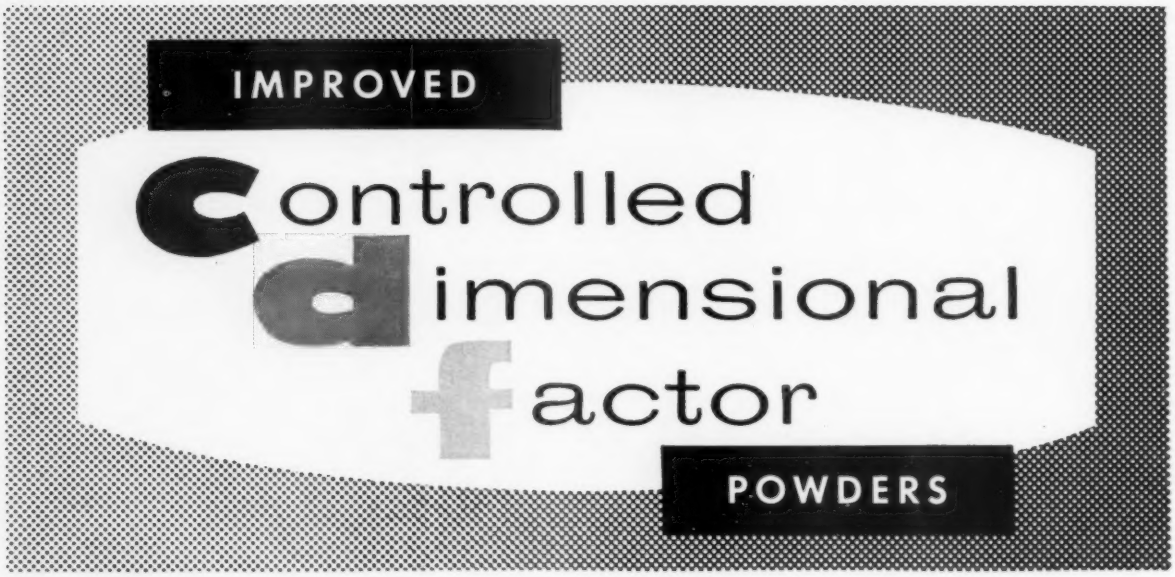

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HOW CDF POWDERS WORK

In the presence of copper, Republic Iron Powder —depending on type—can be made to grow, shrink, or remain stable. The types have been designated as "G" for growth, "N" for normal or zero dimensional change, and "S" for shrinkage. Type "G", for example, may be used in existing dies designed for powders which expand. Type "N" meets the demands of fabricators requiring retention of existing dimensions. Type "S" is suited for use in dies which have become oversize through usage and wear.

ADVANTAGES OF CDF POWDERS

To the tool engineer—Tools can be designed to part-print dimensions with the assurance that tolerances, transverse to the direction of pressing, can be held within ±.001 inches per inch with copper additions. The problem of attempting to compensate for growths or shrinkages resulting from varying techniques of production is eliminated.

To the design engineer—Final part dimensions are established by the consistently uniform shrinkage and growth values of Republic Iron Powders. These predetermined values never vary from lot to lot. Dimensional change characteristics occur in Republic powder after sintering. By cross-blending Types "G", "N", and "S", other pre-determined dimensional changes can be forecast and proven by test.

To the fabricator—Knowing exactly how a powder is going to react before a tool or part is designed, or before a production run is started, can mean important savings. Fabricators benefit from faster production, minimum scrap loss, reduced costs, production of a greater number of parts per pound of powder.

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The improved physical properties of CDF Powders provide higher tensile strengths, greatly increased compressibility, higher elongations in the presence of copper, higher apparent density. In addition, the excellent chemistry, uniform consistency, and high green strength always associated with Republic Iron Powders has been retained.

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Heat and aluminum have been Lindberg's twin babies for many years. If the manufacture of your product requires the application of heat to aluminum anywhere along the line we can help you do the job better. For years our engineering and research staff has been creating improved methods and developing more efficient equipment in this field.

Most recent development is the Autoladle (we call it "Little Joe"), the first practical automatic aluminum ladling unit yet devised. Used with Lindberg melting and holding furnaces "Little Joe" (shown at the right) makes automatic casting of aluminum fast, dependable and economical.

Lindberg's Melting Furnace Division makes a wide variety of melting and holding furnaces for aluminum, brass, bronze, tin, zinc, lead and other non-ferrous metals. These include aluminum induction, nose-pouring crucibles, electric resistance holding furnaces and big reverbs. For foundry, permanent mold or die-casting plant, independent or captive, there are Lindberg melting and holding furnaces to fit your requirements. If your problem in this field needs a special solution Lindberg's design staff can find it. Just get in touch with the Lindberg plant or the Lindberg Field Representative in your locality, or write Lindberg-Fisher Division, Lindberg Engineering Company, 2463 West Hubbard St., Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.

LINDBERG heat for industry

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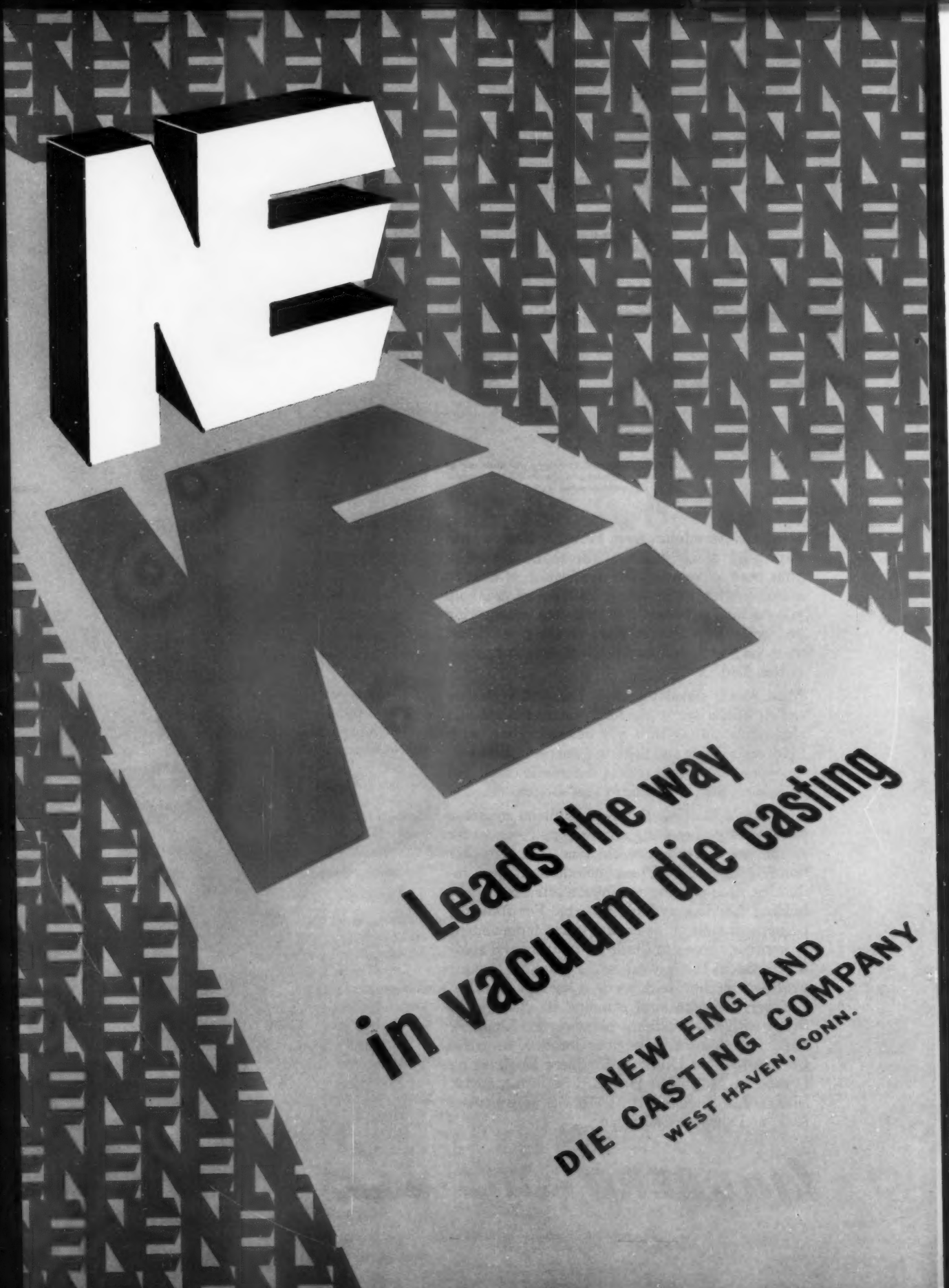
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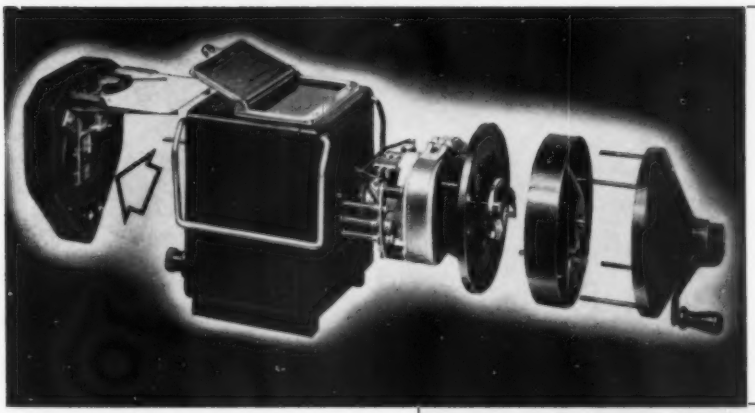


EXPLODED VIEW of the "Megger" shows its various components. Arrow shows the location of the sintered magnet.
Photo: James G. Biddle Co.

SINTERINGS

OPERATIONS ON OLD PARTS

1. Punch pole tips
2. Solder tip-piece to magnet
3. Cut out center section between tips
4. Surface grind both sides of assembly
5. Bore out pole tips .9215 I.D.
6. Mill .125 slot in right tip
7. Mill 2 reliefs in right tip
8. Drill two .125" holes in left tip, one in right
9. Clean in solvent
10. Flash plate copper

OPERATIONS ON NEW, SINTERED PARTS

1. Surface grind tips to uniform thickness
2. Set up 8 pole tips, mill radius to form .9215 I.D. when assembled
3. Cement 5 parts together
4. Sand one side smooth on belt
5. Drill two .125" holes in left tip, one in right
6. Clean
7. Paint black

COVER STORY

Stop Magnet Breaks by Switching to Sinterings

BY F. E. LOMBARD*

THE inherently large grain structure of Alnico with the resulting mechanical weakness was a problem, from a magnet-breakage point of view, for several years at the James G. Biddle Co., in Philadelphia.

It started during the Korean War when we were unable to get magnets to use in Megger instruments because of restrictions on cobalt.

At that time we changed to an Alnico material cast in a modified horse-shoe shape. After production started, we found that a casting, when made in the required shape and density, had certain flaws and stresses that caused a high rate of breakage.

But because the Alnico material's flux characteristics were better than the original material, we tolerated the high breakage until recently.

We were able to start production a short time ago on a completely new magnet.

The magnet which gave us so much trouble was made from an Alnico casting. Its pole tips came from a single bar of steel, punched in the desired shape, then soldered together.

There was one check: If the magnets did not break before final assembly, we knew they were good for the life of the Megger instrument in which they were installed.

But as many as 25% broke in fabrication. Besides, they needed more machining than the magnets now used. In order to get perfect alignment, the tips were punched from a solid bar.

This made sure that both tips were in the same plane and that the surface was flat across the tips. The center section had to be removed after the tip-piece was soldered into place on the magnet, an added operation that cut away 30% of the metal, wasting it.

And only *one* magnet could be cut at a time.

The magnet is now made of five pieces instead of the original pair. Three sinterings and two Alnico magnet-bars are held together with an adhesive. Sintered parts were chosen to eliminate as much machining as possible.

But the best part of the conversion story is the fact that the costs were cut almost in half!

The Megger instrument has another sintered part, a core for its moving system. This part's story is not as dramatic — but 65% savings are very welcome.

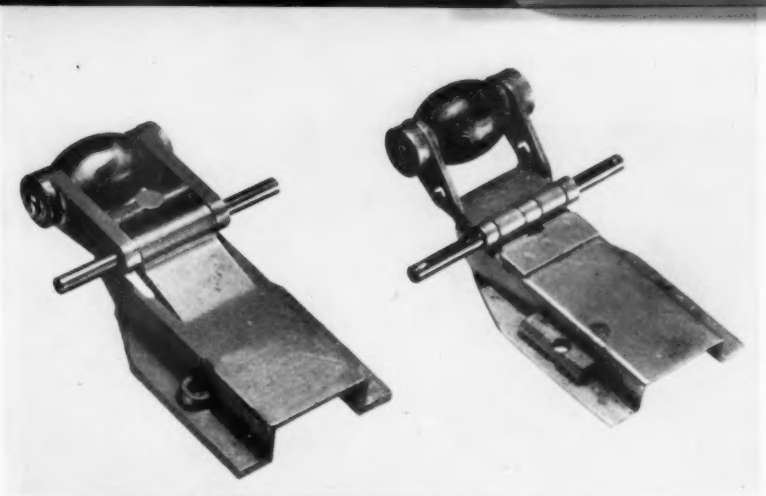
The core used to be made from solid steel-bar stock cut to length. Each end was chamfered and a ¼" center-hole was bored out. Then a slot was milled out on the part's side.

A pair of #2-56 holes were drilled and tapped, then the part was cleaned and plated with .0005" of copper.

But now the sintered core is easily made in one operation. It is purchased pre-plated. Our only operations are: drilling and tapping two holes.

*DESIGN ENGINEER, THE JAMES G. BIDDLE CO.

INVESTMENT CASTINGS



TWO INVESTMENT castings in the hinge at left, replace 11 welded parts making hinge at the right.

When designing multi-part assemblies...

Why Not Make Parts the Simple Way?

TAKE a good look at the two hinges in the photograph. They tell a story important to every designer of machine parts. A little "imagineering" changed an expensive, weak, cumbersome assembly to two clean, low cost, strong parts. Two investment castings replaced eleven stampings and machined parts; soldering and welding were eliminated as assembly methods. Old fashioned notions and practices were scrapped for modern methods of production.

To fully appreciate the value of the shift to investment casting, look at the exploded view. It shows best how many separate operations were eliminated.

Each of the eleven different components had to be machined separately. Here, punch press and press-forming are classed as machine operations. Then, the parts had to be assembled into a single hinge (two parts), by spot welding and soldering.

The joints which would be stressed were spot welded. Strong as spot welding is, it can't compare in strength with a homogeneous, high strength casting. In fact, these hinges often broke. That was one of the reasons why the addressing machine was redesigned.

The new hinge is investment cast in beryllium copper for the Elliott Addressing Machine Co. by the Rode Co. It has all of the advantages of the older hinge. It is far stronger, none have broken in use; and, it costs about 50% less.

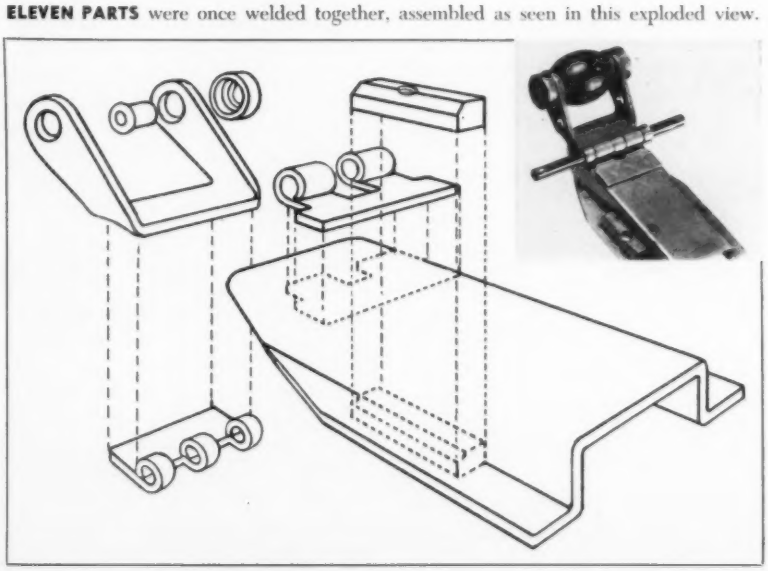
As-cast, all holes are cored. They can be sized by simple reaming. The two mounting holes are tapped to complete the hinge.

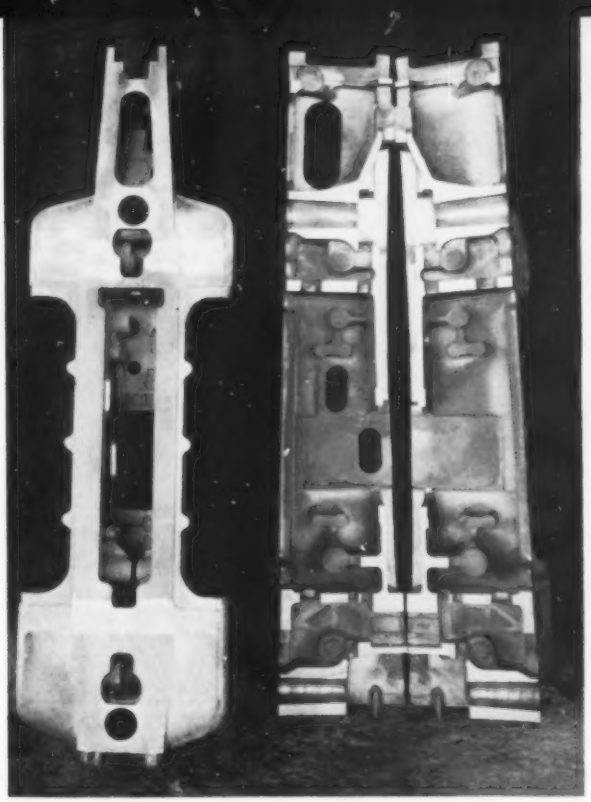
While improved strength, longer life and lower costs are all important, there is an even more important point. Most design engineers think of investment casting as a way to make complex parts that cannot be made in any other way. Yet here is a simple part that can be made in other ways.

But investment casting is the best way and the least costly. Further, it is used on a business machine. Investment castings are rarely used in business machines because the designers mistakenly think these castings are expensive.

Every man who designs or specifies small machine parts ought to consider investment casting along with other methods of fabrication. Very often they will give the best part at the lowest cost.

ELEVEN PARTS were once welded together, assembled as seen in this exploded view.





SEVEN METAL CORES and six sand cores were placed to tolerances of ± 1/32" in the permanent mold casting of this large aircraft pylon cast in Tens-50. *Photo: courtesy Triple A Metalcraft Corp.*

Here's an alloy that will let you...

Design Castings for High Stress Uses

LOW cost castings can now be specified for parts formerly forged to secure the required strength. This is possible because of the development of a high strength aluminum casting alloy, tradenamed Tens-50[1].

Also, because of the higher tensile and yield strengths of this new alloy, parts that have previously been cast in aluminum may be redesigned to give a 25% to 40% saving in weight.

A comparison, Table I, of the mechanical properties of some typical forging, sand casting, and permanent mold casting alloys with Tens-50 shows why many forgings can be replaced with castings and why existing castings can be lightened in weight.

The secret is the addition of small amounts of beryllium and sodium that have the effect of neutralizing the embrittling action of both iron and silicon normally found in casting alloys.

A further action is to improve fluidity of the melt so that sound, thin walls can be cast. With the effect of iron and silicon removed and the irregularity in properties due to segregation controlled, it should be possible to secure highly consistent mechanical properties from casting to casting.

(1) The first published report on this alloy (formerly called 42-B) appeared in PRECISION METAL MOLDING for March, 1957—Pg. 48.

TABLE I

MINIMUM MECHANICAL PROPERTIES FOR DESIGN

Alloy	2014-T6	6061-T6	356-T6	356-T6	Tens-50	Tens-50
Fabrication Method	Forged	Forged	Sand cast	Permanent Mold Cast	Sand cast	Permanent Mold Cast
Tensile Strength psi	65,000	38,000	30,000	33,000	42,000	45,000
Yield Strength psi	55,000	35,000	20,000	22,000	32,000	38,000
Elongation %	10	10	3	3	3	3

TABLE II

Consistency of mechanical properties from melt to melt

Melt No.	Tensile Strength psi	Yield Strength psi	Elongation %
Sand Castings			
173	46,850	36,000	3
174	48,550	37,300	5
175	47,500	38,000	4.5
176	46,900	38,650	3
177	46,600	37,700	3
Permanent Mold Castings			
112	51,600	40,800	9
115	51,900	40,600	10
117	52,700	42,600	7
168	50,000	40,000	5
169	48,000	39,500	4
170	50,500	40,000	6
172	47,500	40,500	3

TABLE III

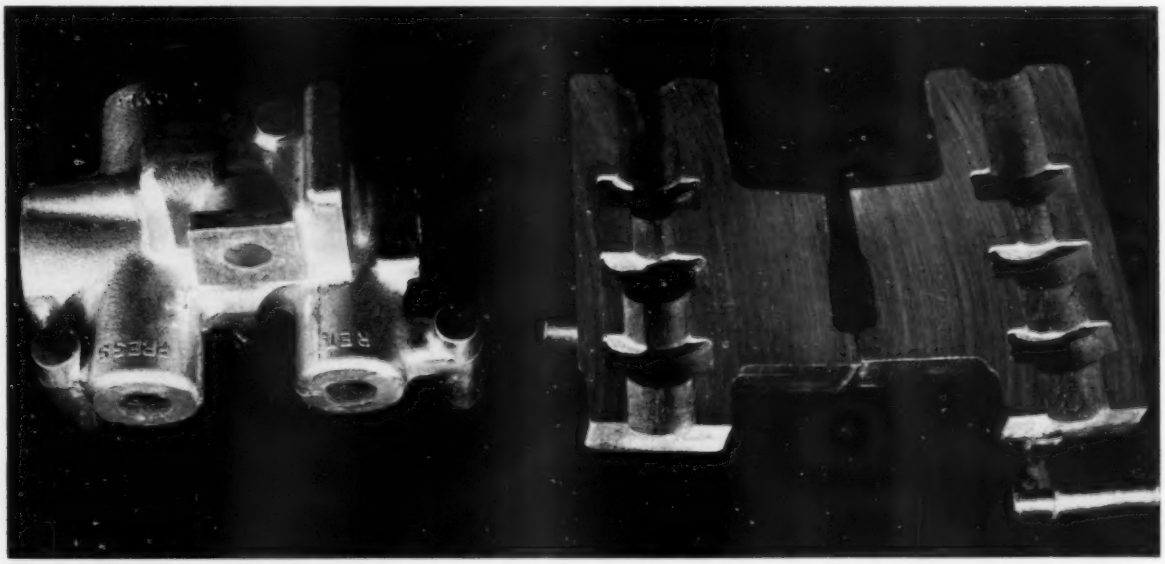
Percent of Room Temperature Strength Retained at 400°F

Sand Castings	
Ultimate Tensile Strength	62%
Yield Strength in Tension	72%
Permanent Mold Castings	
Ultimate Tensile Strength	72%
Yield Strength in Tension	72%

TABLE IV

MECHANICAL PROPERTIES OF TENS-50 ALLOY

	Sand Castings T6		Permanent Mold Castings T6	
Mechanical Properties	**Typical**	**Suggested Design Minimum**	**Typical**	**Suggested Design Minimum**
Ultimate Tensile Strength psi	46,000	42,000	50,000	45,000
Tensile Yield Strength (0.2% offset—psi)	36,000	32,000	44,000	38,000
Compressive Yield Strength (0.2% offset —psi)	36,000	32,000	41,000	38,000
Ultimate Shear Strength—psi	41,000	35,000	44,000	38,000
Ultimate Bearing Strength (e/D=2.0 psi)	98,000	88,000	103,000	94,000
Bearing Yield Strength (e/D=2.0—psi)	62,000	56,000	73,000	67,000
Elongation (% in 2 inches)	5	3	6	3



SPECIFICATION-7500 PSI BURST PRESSURE could not be met in conventional alloys. But this valve, cast in Tens-50 alloy, will withstand 10,000 psi without bursting. Sand cores are placed to tolerances of ±0.010". *Photo: Triple A Metalcraft Corp.*

This is borne out by the laboratory test results shown in Table II.

While the alloying agents used in Tens-50 are primarily designed to improve the room-temperature properties of sand and permanent mold castings, there is also a marked improvement in the elevated temperature properties. At 400°F the ½ hour curve for Tens-50 sand casting -T6 shows an ultimate tensile strength of 30,000 psi compared to 23,000 psi for alloy 356-T6.

Yield strengths for the two alloys under the same conditions are 25,000 psi and 19,000 psi respectively. Tens-50-T6 alloy after 10 hours at 400°F may be expected to retain the percentage of room temperature properties shown in Table III.

This new alloy showed no corrosion when chromic acid anodized and flash hard anodized specimens in both machined and unmachined condition were subjected to a standard 90% hydrogen peroxide compatibility test.

Fatigue properties of the alloy are superior to those of 356 alloy, but not as greatly improved as the static properties.

For design purposes the average mechanical properties for Tens-50 alloy are shown in Table IV. These properties are for section thicknesses varying from ⅛" to ¾".

Here Are 21 Helpful Ideas to

Cut Costs On Machining Die Castings

You can take advantage of the accuracy of die castings to simplify and speed up your machining. Here are some of the setups being used on die castings.

DIE castings can be made unbelievably complex. Holes as small as 0.125″ can be cored, walls as thin as 0.050″ can be cast, and all kinds of mounting and support studs and bosses can be provided in the casting. But in spite of this remarkable flexibility some machining must be done on a large majority of the castings made.

It may be simply tapping, drilling and tapping, surfacing a mounting face or milling a contour that cannot be cast. Whatever the job is, there's a special machine tool that will do it better, faster and cheaper than using standard machine tools with their high jig and tooling costs and high direct labor costs.

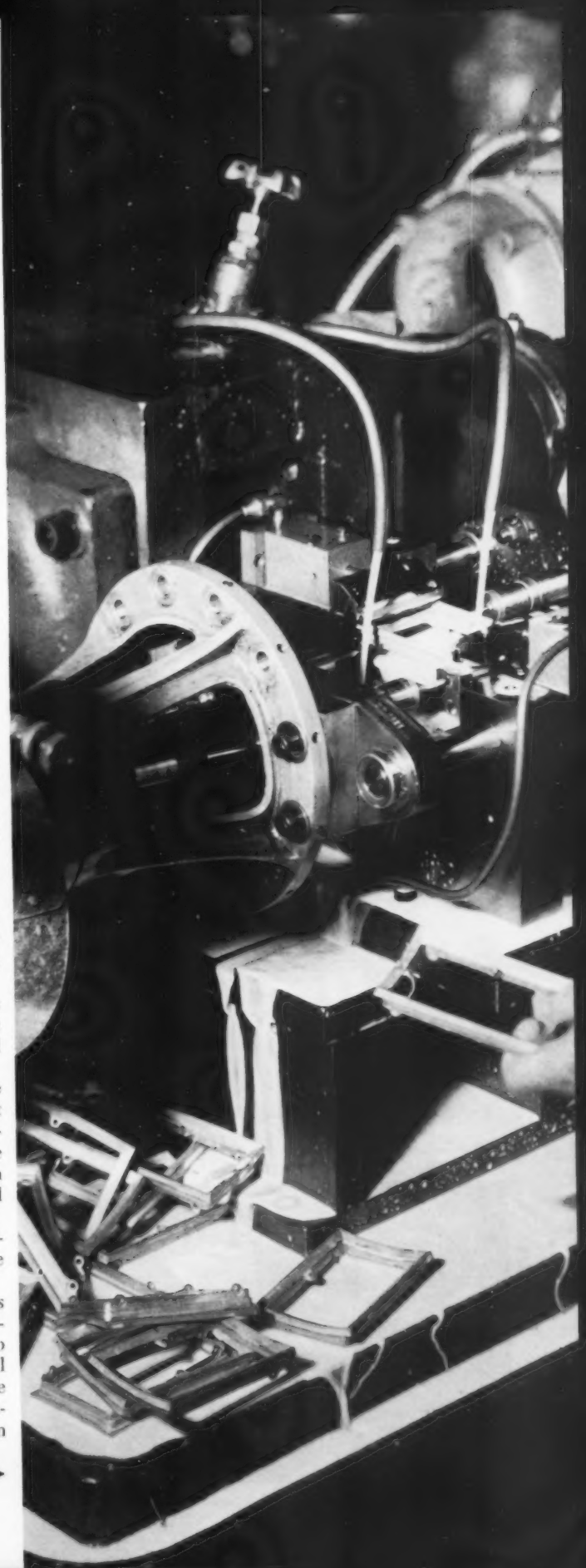
Sometimes a completely special machine that is capable of performing three, four, five or more types of jobs may be used. As the part design is changed only tooling must be changed.

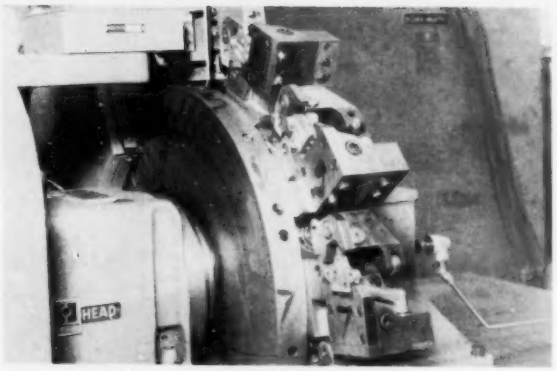
In other cases standard "units" are combined to give the number and type of machining operations that may be desired. These standard units are often mounted around an indexing table or along a straight line conveyor. When the job is completed the machine can be torn down and the standard units re-assembled into other machines.

Some of the special machines and some of the standard components that can be used to build up machine tools are shown on the following pages.

1 Typical of the versatile special units for high speed production is the multiple spindle drill head shown. Here two heads are mounted on horizontally opposed drill presses. A die-cast bezel is held in an air fixture while each press drills and taps two holes. The operator inserts a casting, pushes a button and after the operation is complete removes the part. COMMANDER MFG. CO.

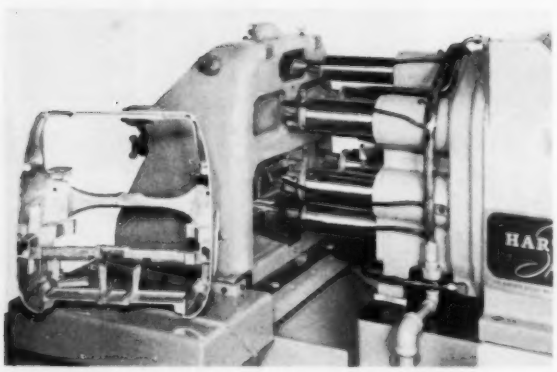
Turn the page for more ideas ⟶





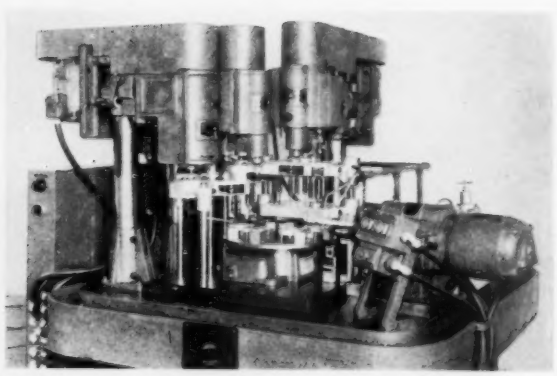
2 **AUTOMATIC PRECISION FACING** on a specially designed, fully automated work handling fixture with a single end Bore-Matic. The unit shown is a twelve station trunnion-type ferris wheel fixture rotated continuously at ¾ rpm, manufactured by THE HEALD MACHINE CO.

OPERATIONS: Precision facing the face on a die cast aluminum hydraulic fluid distributor. Part holders automatically open and close at the 60° point and work is loaded and unloaded on the fly. Stock removal is 0.016 to 0.046 with a flatness tolerance of 0.0003. Production is 410 pieces per hour. Automatic gauging prevents damage from oversized or improper clamping.



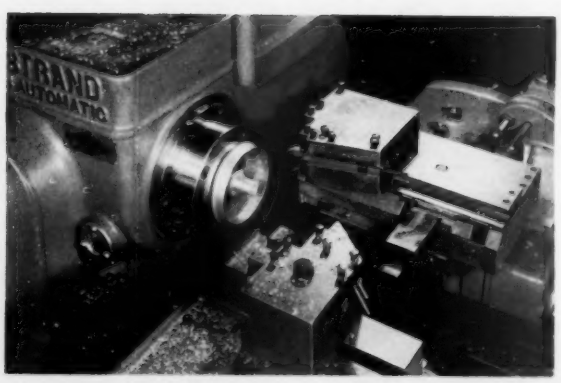
3 **MULTIPLE SPINDLE MILLING** can speed up production and cut machining costs sufficiently to make the investment in a special tool worthwhile. The seven spindle milling machine illustrated is built by THE HARTFORD SPECIAL MACHINERY CO. Slotting, face milling, end milling and almost any other type of milling operation can be done that allows the use of a fixed spindle and horizontal traverse.

OPERATION: The die cast typewriter frame shown has seven elongated bosses that must be face milled. Clamping is manual in a contoured fixture. Forward and reverse traverse are powered and automatic. Production rate at 100% efficiency is 125 pieces per hour.



4 **AUTOMATIC DRILLING, TAPPING & REAMING** can be set up by using stock rotary heads with automatic indexing tables. Air or mechanical clamping may be used. The special assembly shown was built up by ETTCO TOOL & MACHINE CO., INC. from nine standard units; a table, an indexing head, 3 drill units, one lead screw tapping unit and 3 multiple heads.

OPERATION: A die cast stator for a small gasoline engine magneto has eight holes drilled, one hole reamed, two holes tapped and four holes deburred. Tolerances are held to ±0.002. Production rate 400 completed pieces per hour.



5 **AUTOMATIC LATHE OPERATIONS** that require operator attention only to load and unload. All other operations are automatic. By using front and rear slides to carry the tools, and by using carbide tooling to hold wear to a minimum the SUNDSTRAND MACHINE TOOL CO., makers of the lathe, achieved high production, close tolerances and excellent duplication from piece to piece.

OPERATION: Four tools are carried on the front slide to machine three different diameters and break one corner. The rear slide carries three tools to face three different surfaces. Production rate on die cast parts is 100 pieces per hour.

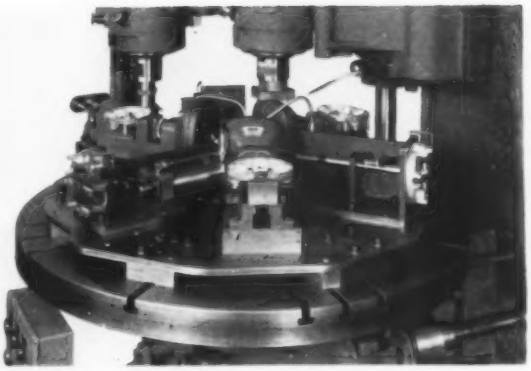
6 **CUSTOM BUILT TOOLING** can be designed to hold precise tolerances, especially when it is combined with specially built machine tools. On a twelve station rotary machine built by the DRILL UNIT MACHINE CO. a total of 84 individual tools are required to perform the machining operations. In addition to the large number of operations the part has a total of 52 locating dimensions used during each cycle. Solution to the dual problems of accuracy and tool breakage were found in SCULLY JONES & CO. floating tool holders. With this combination drilling, tapping, turning, facing and counterboring operations are done to required precision.

7 **AUTOMATIC MILLING, DRILLING & TAPPING** on a multi-station rotary indexing machine equipped with separate heads to carry machining spindles. Designed and built by the KINGSBURY MACHINE TOOL CORP. Both single spindle and multiple spindle heads are used. Work is fixtured vertically with power clamping and automatic release.

OPERATION: A 22 spindle machine using a 30 inch indexing table with eight stations. Milling, drilling, countersinking and tapping are done on a die cast sole plate. The first four stations drill and countersink seven holes and drill eleven holes. Production rates are 520 pieces per hour.

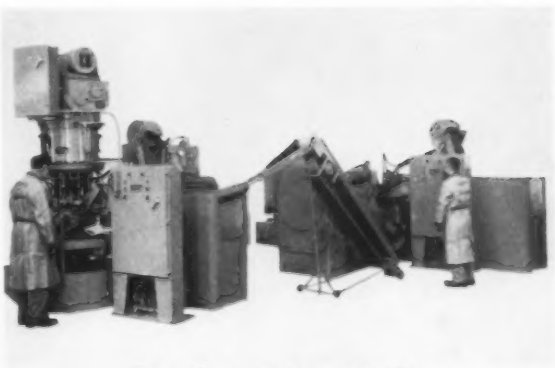
8 **CONTOUR & FACE MILLING** at high speeds is done on this dual head milling machine. It is equipped with an outboard head mounted on a pivot arm for movement through a follower arc. The machine, built by ONSRUD MACHINE WORKS, INC., is thus able to do vertical milling on straight or contoured lines. A center milling head on an adjustable arm permits face milling operations.

OPERATION: The machine illustrated has a six station rotary indexing table with power clamping and automatic ejection. The die cast meter housings require face milling of the sides mating faces and lugs. One station does slot milling. Production, eight pieces per minute.

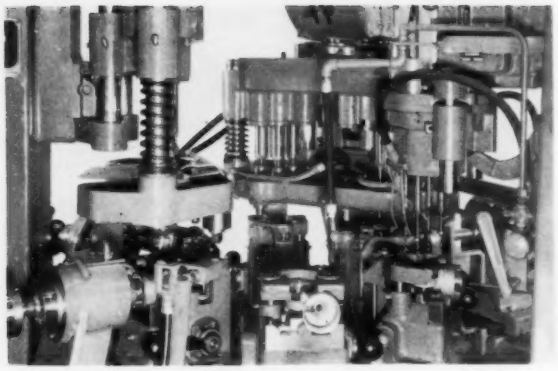


9 **AUTOMATIC MILLING** using both vertical and horizontal machines equipped with hopper feed and automatic transfer between machines. The 1A Rotomatic and the 8SV Rotomatic are built by DAVIS & THOMPSON CO. Both machines utilize automatic indexing tables with automatic chucking of the parts from a hopper feed.

OPERATION: The die cast parts are dumped into the hopper on the milling machine at the right. They are automatically chucked and milled to length. A transfer unit conveys them to the vertical milling machine hopper from which they feed to the indexing table for reaming. Production rate 3000 per hour.



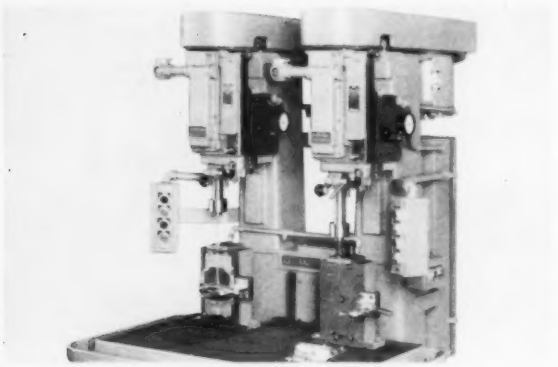
Turn the page for more ideas



10 **DRILLING & BORING MACHINES** set up with indexing tables and hydraulically actuated machining heads perform complex operations automatically.

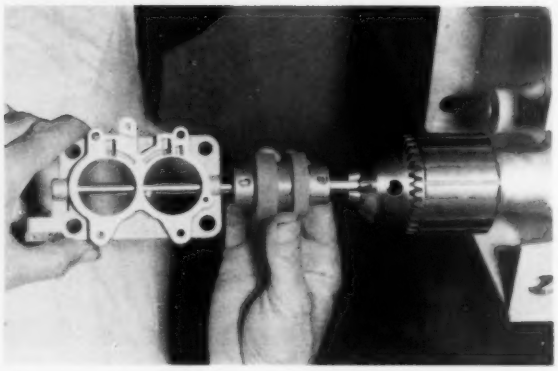
The indexing type drilling and boring machine illustrated is built by THE HARTFORD SPECIAL MACHINERY CO. A six station horizontal table unit, it carries two types of cam-feed drilling heads and two lead screw tapping units. Three different gear housings can be processed.

OPERATION: The aluminum die cast parts are bored, faced, hollow milled, drilled and tapped. Clamping is manual with interchangeable clamping nests. Production 256 parts per hour at 100% efficiency.



11 **HYDRAULIC FEED DRILL PRESSES** can be set up for a degree of sensitivity and speed not possible with other machines. On the presses made by LELAND-GIFFORD CO. the hydraulic components which control the spindle feed are a self contained unit built into the press. Fast approach, controlled feed rate, withdrawal for chip clearance and final retraction from a preset depth can all be set up for fully automatic operation.

OPERATION: Drilling a 3/32" dia. hole, 3.84" deep in a carburetor die casting. This unit is set for 5600 RPM spindle speed, 0.003" per revolution feed for a net drilling speed of 24 seconds per hole.



12 **HIGH SPEED DEBURRING** to precision finishes with tooling designed to deburr and chamfer both outside and inside.

The tool shown is a Nobur with a fully retractable cutter so that precision bores will not be damaged by passage of the tool's pilot. Manufacturer the NOBUR MFG. CO.

OPERATION: Burr removal at six surfaces along the axis of a hole which is line-drilled through the die cast valve holder. Surfaces must be clean and free of obstructions to permit smooth butterfly valve operation. Small chamfer also aids in assembly. Production rate 600 parts per hour.

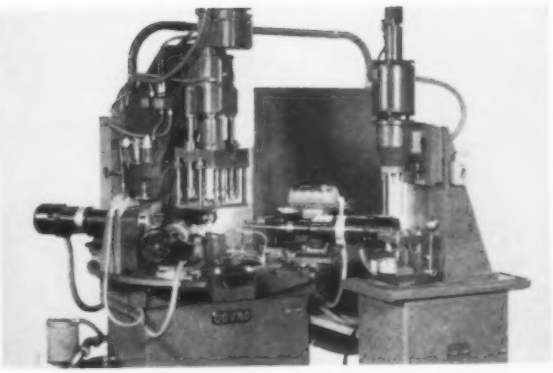
13 **AUTOMATIC MOVEMENT** of either work pieces or tooling through the use of air cylinders and air operated indexing devices.

Illustrated are three standard drill presses, each equipped with a multiple drill head. The presses are controlled with air actuated drill press feeds and the work table is a four position air actuated rotary index table. All air control equipment by THE BELLOWS CO.

OPERATION: Drilling the fly-wheels for outboard motors. Location of the holes and size of the holes are both critical. Through the use of shop built equipment faster production and fewer rejects result. Production rate 1080 pieces per 8 hour shift.

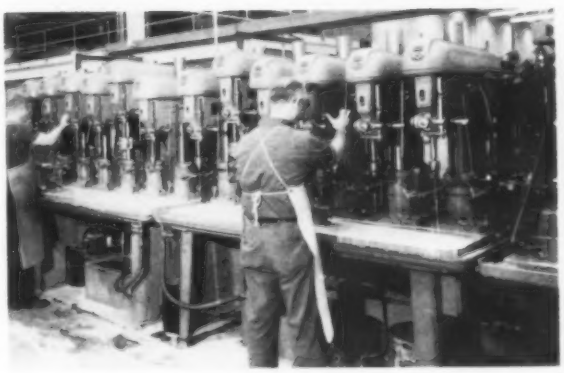
14 **DRILLING & TAPPING MACHINES** are often unit components on standard bases. They can be quickly altered for different jobs. In the two units shown the smaller one is for drilling two lateral holes the could not be cored while the larger one is for tapping a plurality of holes simultaneously. Both units were built by THE GOVRO-NELSON CO.

OPERATION: Two lateral holes are drilled, automatically, in the die castings by the smaller machine. In the larger unit, the part is placed in a work holder and clamped by a pressure plate. Up to thirteen vertical holes and seven horizontal holes can be tapped simultaneously. Production 300 parts per hour.



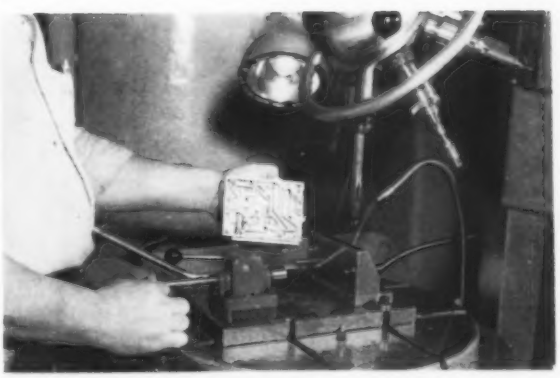
15 **IN LINE DRILL PRESSES** set up to do a variety of operations. With properly designed holding fixtures, one operator does a variety of jobs.
The individual drill press units shown can be mounted for straight line, return circuit or any other work plan desired. The press units and stands are made by the DELA DIV., ROCKWELL MFG. CO.

OPERATION: Two groups of six drill press heads are closely mounted on each table. Using only five heads on die cast parts, precision drilling, reaming, counterboring, spotfacing and tapping are done by each operator.



16 **TURRET DRILLS** for mounting on standard drill-presses afford multiple tooling at single stations without a separate set-up for each tool. The unit illustrated, made by HOWE & FANT, INC., will accommodate at least six different tools. Drilling, boring, tapping, reaming, end milling are some of the jobs that can be done on this type of equipment. Work is held in a cam operated holding fixture which may be moved manually or may be power indexed.

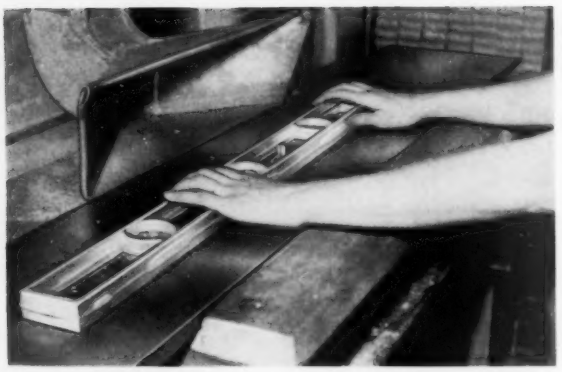
OPERATION: The die casting shown requires taphole drilling, tapping, reaming and chamfering. Spindle speeds and depth of cut are adjustable. Production rates depend on the operator.



17 **AUTOMATED DRILL PRESS FEEDS** can be attached to most standard presses. They give great speed and sensitivity.
The GENERAL-PACIFIC CORP. feed device is illustrated. It can be set for fast approach to the work with a pneumatic cylinder and then controlled hydraulic spindle feed at slower, preset rates to fit the drilling job being done. Drilling depth can be preset.

In deep drilling work the feed may be set to drill to a certain distance into the work, then retract for chip clearance, re-enter at high speed to within 1/32" of bottom, then advance at drilling speed again. Drill return is by the spindle spring.

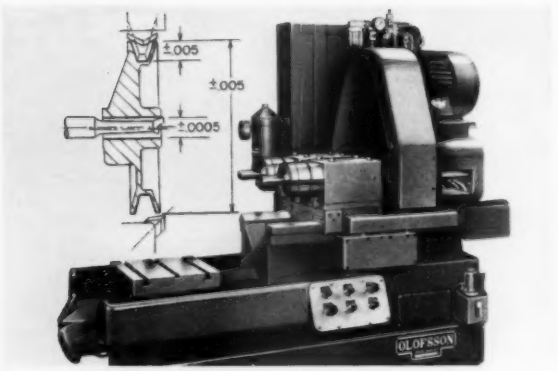
Turn the page for more ideas



18 **MACHINE DEBURRING** with high speed rotary tools, either off-hand or on fixtured production lines, speeds up production and lowers costs.

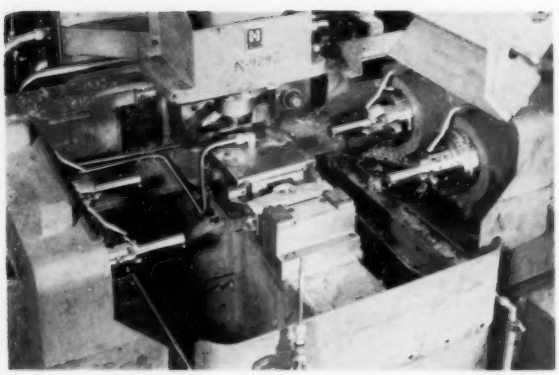
One type of deburring tool is shown in use. This unit made by PRECISE PRODUCTS CORP. is adaptable to free hand use, table mounting as shown, or for mounting on the tool holder of lathes. The tool is very high speed to give smooth cuts. It can use midget mills, burrs, or mounted abrasives.

OPERATION: Flash left by the trimming operation is being removed. The power unit mounts under the table. Saving over hand filing 40%.



19 **AUTOMATIC BORING,** facing, chamfering, turning and grooving operations can be done easily and inexpensively on the precision boring machines manufactured by THE OLOFSSON CORP. With the proper tooling, the built-in hydraulic equipment and controls require that the operator chuck and remove the parts. All operations are automatic.

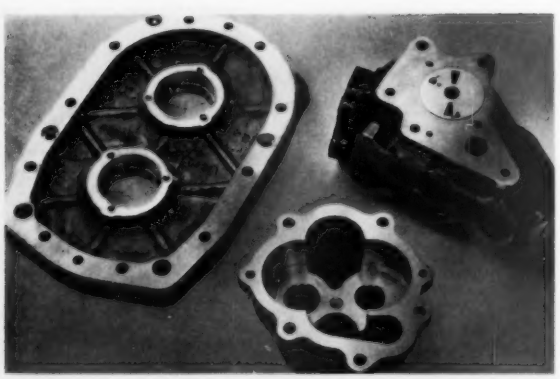
OPERATION: On the double spindle machine shown, the operator chucks the die cast pulley in either an air or mechanical chuck. The machine finish bores, turns the OD, grooves and chamfers. When the operation is complete the part is ejected automatically. Production 190 pieces per hour.



20 **PRECISION BORING** with a stationary work holder and rotating tooling mounted on horizontal and vertical slides.

The machine shown is a model S Bore-Matic manufactured by THE HEALD MACHINE CO.

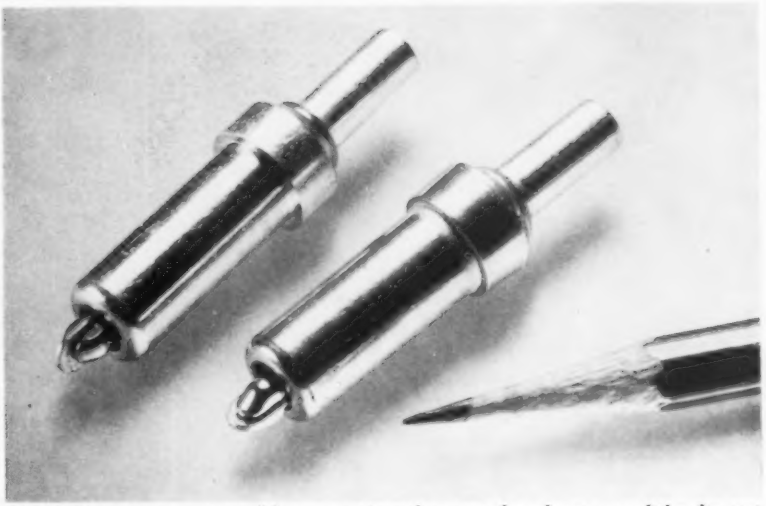
OPERATIONS: Turn, chamfer and plunge face 29 different surfaces on aluminum alloy die cast door closer bodies. The machine is equipped with two horizontal and one vertical slides and two work holders. Parts are semi-finished at the front station and finished at the rear station. Air operated feed-out quills are used for tool retraction. Fully automatic, the production is 47 parts per hour.



21 **LAPPING** to produce a perfectly flat, scratch free surface can be done on the Lapmaster made by the CRANE PACKING CO. The operation done on aluminum die castings gives a finished surface fine enough to be oil-tight without the use of gaskets or sealing compounds.

OPERATION: After a machine facing operation the aluminum and magnesium aircraft castings are lapped in a free unclamped state. The final finish is under 8 microinches RMS and the pieces are held to a flatness tolerance of less than 0.0002" TIR. Only by using a machine that can operate on unclamped parts can the required flatness be maintained.

When off tolerance means production shut-down, then . . .



CLEANER, more accurate and less expensive: these are the advantages of the die cast sleeve over a steel sleeve.

Die Castings Replace Screw Machine Parts

By **SCHOLER BANGS,** Western Editor

AIRCRAFT and missile industries gobble up millions of the little, hole-insert holding clamps produced by Monogram Mfg. Co., of Culver City, California.

The sleeve that contains the clamp's spring-loaded moving parts has to be tough to take the beating on a fast-moving plane/missile production line. And, for high-precision action of moving parts, its inside diameter tolerance must be held to $\pm 0.002''$.

Steel seemed the logical material to meet the rigid specifications for strength and tolerance. So, steel sleeves were turned out on automatic aircraft-precision screw machines through the war years.

That was before engineers of A & A Die Casting Co. learned that Monogram was having tolerance problems and a high reject rate in sleeve production. Screw machine setups varied from one batch to the next.

On long runs, normal machine and tool wear produced out of tolerance parts. Failure to catch an off-tolerance run stopped the assembly line.

The custom die caster suggested switching to a zinc die cast sleeve.

"We've been happy ever since," reports James Pincin, Monogram's production control and plant manager enthusiastically.

Today more than 95% of the production of hole clamps have die cast sleeves. Here are the direct results of the switch.

The tolerance "bug" has almost vanished.

Production source slowdown has ended.

Assembly down time due to off tolerance sleeves has ended.

In 4,500,000 sleeves Monogram saves $25,875. This is a 35% reduction in the cost of this clamp component.

Also attractive to the clamp manufacturer was the ability of the die casting company to cast the name "MONOGRAM" on the collar end of the sleeve. No identification had been practical on the steel sleeve.

Less than 5% of the clamp production is still in steel sleeves. One major airframe company still specifies steel so they can re-plate clamps that have lost their size-color code through long use. The die cast clamps cannot be re-colored satisfactorily, although a new re-plating process is being tried.

The venture into die casting of the sleeves was casual. Company engineers doubted seriously that the sleeve design would lend itself to economical die casting. On a deep, thin-walled casting air trapping and ejection might be serious problems.

Solution of the basic problems involved minor but important modification of the sleeve's dimensional design.

A slight draft was incorporated in the collar of the sleeve to help ejection. A new stripping technique was developed to overcome binding. In view of the ID tolerances, core design was critical and involved holding draft to $\pm 0.002''$. This was done by tapering the core from the + limit at the base of the core to the − limit at its end.

Conventional gating and venting were used to overcome air entrapment, bubble rejects were low.

The dies perform well. A matrix produces 1,000,000 parts (10 per shot), and core sections retain dimensional accuracy for 200,000 to 300,000 parts.

The completed sleeves require a minimum amount of finishing—ball burnishing, followed by barrel plating to color-code the parts for shop identification.

HOW TO MAKE a Shaw Process casting is shown in this series of photos: 1. Brass pattern is mounted on base; 2. Slurry is poured into mold box to cover pattern completely with wall-thickness of ½" to ¾"; 3. Volatile constituents are burned off, resulting in minute cracking of the mold for permeability and heat resistance; 4. Mold halves are cemented together; 5. Casting is accomplished by gravity pour; 6. Finished casting shows good fidelity of detail.

Cast Die Cavities. . .Part II

BY IRWIN LUBALIN**

HOW DO WE MAKE A DIE CASTING CAVITY?

Primarily it is necessary to produce a pattern of the cavity required having a shrinkage allowance of .0165" per inch to allow for solidification shrinkage. This pattern can be plaster, rubber, epoxy made from a model, or it can be wood, acrylic, or metal, which can be made by machining and glueing or laminating, brazing a number of pieces together to provide a smooth and accurate replica of the required part.

We start with a typical pattern. The series of illustrations shows the technique used to produce a mold cavity.

Steel Pouring – When casting die-casting dies, we have been casting the AISI H-13 5% chromium hot-work steels for zinc and aluminum applications, and AISI H-21 for brass die casting.*

The following casting characteristics are needed in a steel, in addition to hot work characteristics:

1. *Fluidity* – It must be sufficiently fluid to faithfully follow the finest engraved detail.

2. *Finish* – It must be capable of solidifying to a smooth finish without 'orange-peel' appearance.

3. *Reliabiltiy* – It must be a steel which is reliable in heat treat.

The 5% chromium steels meet these requirements provided they are very clean and free from impurities. When the casting is normalized before annealing, movement in heat treatment is less than that found in machined cavities.

4. *Degasification* – A special degasification technique which adds fluidity to the alloy and permits solidification without the formation of tiny surface gas-pin-holes has been developed.

5. *Steel Shot* – Alloy is bought as clean shot to keep all impurities out of the melt. A major advantage here is the ability to keep all steel inventory in the form of barrels of shot. Consequently, it is not necessary to have a variety of different wrought bar sizes for cavity work.

6. *Metal Cost* – Since it is not necessary to forge, roll, and cut the steel bars, alloy in shot form costs 50% less than wrought stock. There is no scrap involved, as there would be in die-sinking the cavity, so that metal costs generally run approximately 25% of metal cost in conventional die sinking methods.

7. *Melting and Pouring* – Steel making is unnecessary since the shot is bought to specific analysis. It is only necessary to use a simple indirect arc furnace with two opposed electrodes working off a welding transformer. These electrodes melt the steel inside of a crucible. When the steel comes up to the proper pouring temperature it is either poured directly into the mold or transferred to a heated ladle from the furnace and poured into the mold.

After cooling, the castings are knocked out of the mold and are sand blasted or vapor honed and the riser cut off on an abrasive wheel cut-off machine.

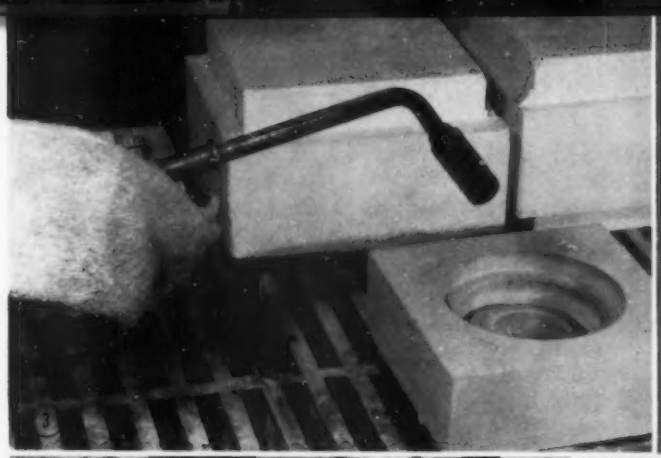
There is no waste involved here since risers are remelted.

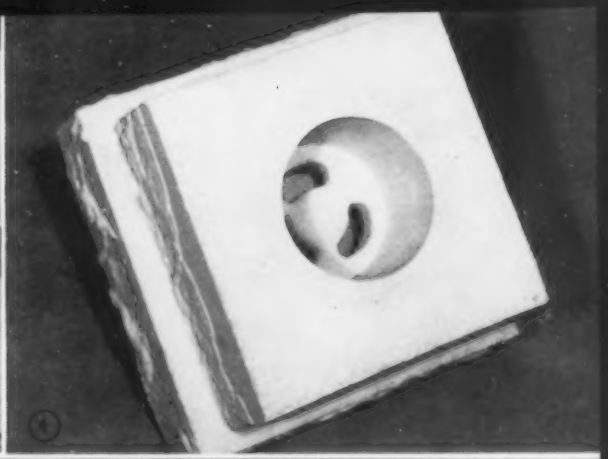
8. *Finishing* – Cast cavities are finished by riffling and polishing just as machined cavities would be. However, since there are no tool marks and consequently no undercuts which would be caused by chips gathering on a milling cutter, considerably less riffling is necessary before the polishing operation is carried out. In a number of cases where the die castings did not require "hardware finish," cavities have been used as-cast.

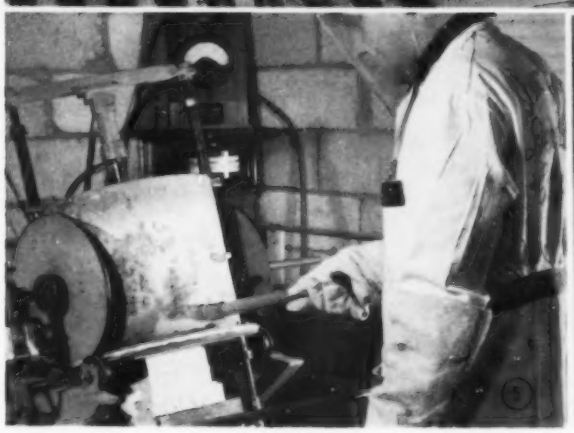
9. *Heat Treat* – Heat treat methods are identical to those for 5% chromium. 1% vanadium wrought stock machined cavities. However, it has been found helpful to include a normalizing operation prior to annealing. Normalizing is carried

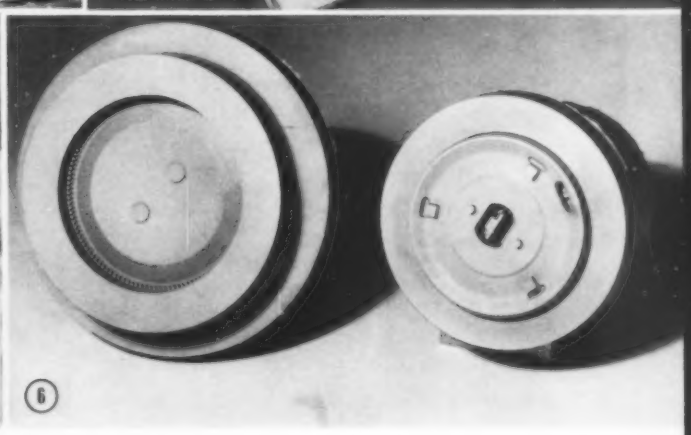
*See PMM Technical Reference File Aug. 1957 Page 42 "Steels for Die Casting Dies."

**GENERAL MANAGER, SHAW PROCESS DEVELOPMENT CORP.









out by soaking it at 1600° F for two hours then air cooling. This is followed by annealing at 1600° F for two hours with a slow cool at 50°F per hour until 1000° F. Annealed hardness should be approximately BHN 210.

Heat treatment is carried out in salt baths as follows: Cavity is preheated to 1625° F. Quenching temperature is 1850° F. Soaking time 30 minutes. It is air cooled and tempered at 1000° F for three hours. Tempered hardness is 47 R_c.

10. *Economics* – Obviously one of the major factors involved in this process is the ability to produce, once a pattern is made, as many cavities as are necessary at extremely low cost. Our experience has been that substantial savings over conventional techniques have occurred in almost every case with a majority of cases showing spectacular savings.

11. *Speed* – Another item of major importance is the ability to produce a cast cavity in a short time. Although, for practical purposes it takes a full day to produce a casting from the time the pattern is received we have, on occasion, submitted cast cavities and cores for die-casting dies on the same day that patterns were received.

12. *Die Life* – Of course this is the very crux of the entire problem. Regardless of the speed at which a die cavity can be made and the cost saving, the entire problem relates to how good the cavity is.

At the present writing, eight major diecasting job shops, six in the United States and two in England, are licensed to make diecasting dies by the Shaw Process, hundreds of which are presently in day-to-day production.

The results so far, indicate that Shaw-cast cavities and cores which do not have substantial amounts of the cast skin removed by machining and polishing, result in die life 50% to 60% superior to dies machined by conventional die sinking methods from wrought stock.

Metallurgical studies seem to indicate that this is a function of the fine grained skin of the Shaw casting as well as the absence of incipient cracks and scratches caused by machining.

13. *Die Operation* – An improvement in the operation of Shaw cast dies over machined dies has been found in many cases. Better heat dispersion is found when an entire intricate cavity can be cast in one piece, not in a series of inserts.

Also, the one piece casting eliminates flash traps between inserts. The elimination of tool marks in deep narrow cavities produces less dragging or undercuts making operation of withdrawal from the cover half as well as ejection easier. Thus less lubricant can be used in the operation of a die which will reduce the number of rejects.

Complex water systems have been used which could not be drilled in a tortuous manner. All sorts of water jackets can be easily produced using Shaw material to core out the inserts.

Elaborate gating systems, overflows, and runners which may often be difficult to machine are easily produced in a positive form and attached to the original model of the part before the plaster or plastic facsimile of the cavity is made prior to manufacturing the steel casting.

Part III will be published in September PMM.

DATA OFFERED IN THIS MONTH'S ADS

the Reader Service Cards on the facing page will get you these free reference materials. Circle the numbers and mail.

6. Air-Hydraulic Trim Press—delivers 25 tons at high cycling rates, and can be moved easily from place to place. Complete details are available from B & T Machinery Co.

7. Engineering Handbook—gives 24 pages of data on composition, manufacture, and use of sintered powder products. Bunting Brass and Bronze Co.

8. Vacuum-Melted Alloys—Cannon-Muskegon Corporation offers a bulletin about Ultramet Alloys. Available in a wide variety of cast or wrought forms.

9. Bonus Features—of die casting machines from Cast-Master, Inc. are explained in a catalog.

10. 7 Models—of hydraulic die casting machines are described in literature from The Cleveland Automatic Machine Company. Includes complete machine specifications and quotations.

12. Standardized Die Components—which reduce design time and cut die construction costs are described in a 170 page catalog published by Detroit Mold Engineering Co.

14. New Tapping & Drilling Head—adjustable to any pattern of holes is presented in literature from Errington Mechanical Laboratory, Inc.

15. Die Cast Fasteners—are described in literature from Gries Reproducer Corp. Includes wing and round head thumb nuts and screws, cap nuts.

16. Metal Powders Data—A complete reference manual on metal powder raw materials is available from Charles Hardy, Inc.

17. Zinc Alloys Facts—"Reference Book and Guide on Zamak (Zinc Base) Die Casting Alloys", offered by Henning Bros. & Smith, Inc., gives valuable production and design data.

19. Powder Metallurgy Savings—are explained in a fact-filled 12-page brochure from Hoeganaes Sponge Iron Corporation.

21. Heavy Duty—die casting machines with automatic ladling design features are described in literature compiled by Hydraulic Press Mfg. Co.

22. High Melting Rates—are provided by INDUCTO Push-Out furnaces. Complete information is available from Inductotherm Corporation.

24. Compacting Presses—Hydraulic and mechanical models in capacities from 10 tons to 500 tons are presented in an illustrated catalog from Kux Machine Co.

25. Wax Injectors—Complete specifications and features of three models of all-hydraulic wax injection machines have been issued by Leyden Hydraulics, Inc.

26. Induction Heating Data—36 illustrated pages, in the Lepel High Frequency Laboratories, Inc. catalog gives valuable information on Lepel induction heating equipment.

33. Split Thrust Bearings—which save space and weight and hold against rotation and high thrust are presented in an illustrated folder and data sheet. National Molded Products, Inc.

37. Cutting Costs—with brass powder metallurgy is explained in a booklet evaluating this modern production method in terms of particular needs. The New Jersey Zinc Company.

41. Sinterings Savings—A brochure entitled, "How to Cut Precision Parts Costs with the Remet Powdered Metal Process", is available from Reese Metal Products Corp.

42. Improved Physical Properties—of Republic CDF iron powders are described in literature compiled by Republic Steel Corporation.

43. Die Components—which cut set-up time and labor costs are presented in literature issued by Richards Tool & Mold Co.

44. Fire-Resistant Hydraulic Fluid—complete technical information on Shell Irus Fluid 902 has been issued by Shell Oil Company.

47. Fire Prevention Data—A new booklet entitled, "Ucon Hydrolubes Spell Safety", gives all the facts on these fire-resistant fluids, which eliminate the common fire hazards connected with hydraulic operations. Union Carbide Chemical Co.

49. Investment Casting Services—Westinghouse Electric Corp., Materials Manufacturing Dept., will design, engineer and produce parts to customer specifications. Detailed information is offered.

50. Piston Lubricator—Illustrated folder describes the Dorsey automatic piston and cylinder lubricator for aluminum cold chamber die casting machines. Westbrook Mfg. Co.

52. Chromate Color Coatings—for zinc-plated small parts are described in literature offered by Chemical Corporation.

54. Metal Finishing Products—Folder describes a complete line of black oxide finishes, chromate finishes, cleaners, oils, and strippers. Heatbath Corporation.

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8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306

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4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293
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6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297
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11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304
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(Above) Red-hot steel slabs, weighing over 2 tons each, are at arm's length from hydraulic lines filled with Irus Fluid 902—YET NO FIRE HAZARD.

(Right) The distinctive yellow color of Irus Fluid makes it easy to spot and trace hydraulic line leaks.

"After numerous tests, we selected Shell Irus Fluid 902 because of its excellent fire resistance and low cost,"

says Norman Bracht, Lubrication Engineer, Alan Wood Steel Company, Conshohocken, Pa.

A fire in the strip mill, causing serious equipment damage and plant down time, convinced the Alan Wood Steel Company that a switchover to a fire-resistant hydraulic fluid was imperative. After extensive testing with various commercial types, Shell Irus Fluid 902 was selected. Now . . . twelve months later . . . Alan Wood is convinced that serious hydraulic fires in strip mill tilt table are a thing of the past.

Irus* Fluid 902 is a specially compounded water-in-oil emulsion which has exceptional fire resistance. Plant tests show, time after time, that Irus Fluid 902 *actually snuffs out fire!*

Many plant operators, like Alan Wood Steel, have discovered that Irus Fluid is economical . . . costing up to one-third less than other fire-resistant fluids, yet its performance is comparable in every practical respect.

If your present hydraulic equipment is vulnerable to accidental fire hazard, we suggest that you obtain complete technical information on Shell Irus Fluid 902. Write: Shell Oil Company, 50 West 50th Street, New York 20, N.Y. or 100 Bush Street, San Francisco 6, California.

*Registered Trademark

SHELL IRUS FLUID 902

a low-cost, fire-resistant hydraulic fluid

SHELL

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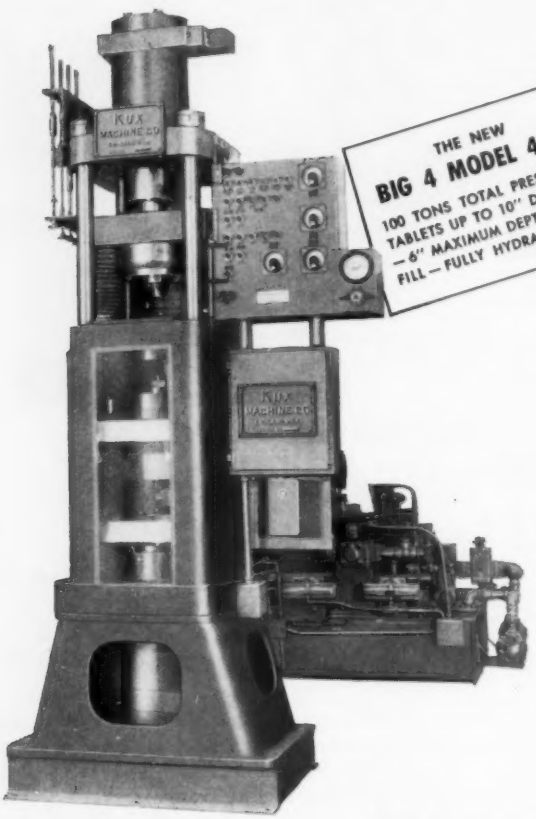
POWDER METAL PRESSES

FROM 10 TONS TO 500 TONS • DIE FILLS UP TO 15"
HYDRAULIC OR MECHANICAL MODELS

An entire range of sizes and models, both mechanically and hydraulically operated is available in the Kux family of powder metal presses, a few of which are illustrated. A card will bring you an illustrated catalog of these famous machines which set the standards for peak performance.



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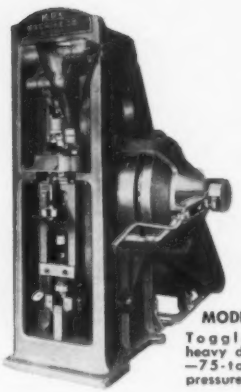
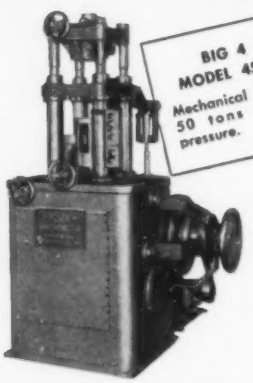
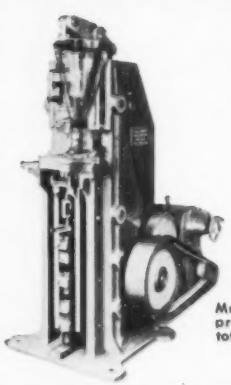


MODEL 65B
Toggle type heavy duty press —75-ton total pressure.



BIG 4 MODEL 450B
Mechanical press 50 tons total pressure.



MODEL 64
Multiple motion press — 30 tons total pressure.

- **Fully Hydraulic** — applies pressure to tablet with both upper and lower punches. Lower punch ejects tablet with full forming pressure.
- **Completely Automatic** — pushbuttons operate machine continuously or through a single cycle with an automatic stop position.
- **Accurate Dimensional Thickness of Tablets** — upper and lower punches come to a positive mechanical stop position, holding thickness of each tablet.
- **Always True Density** — upper and lower punches can be adjusted to come to a hydraulic pressure stop position, applying exact pressure on the tablet to give true density regardless of variation in die fill.
- **Perfect Punch and Die Alignment** — combination leader-pin, ball-bearing guides keep upper punch in perfect alignment with die at all times, so that close tolerance parts can accurately be made.
- **Push Button Control of Adjustments** — for upper punch penetration into die, and the die fill allows instant and accurate change of either setting, and scales show the exact position of the punches at all times.
- **Independent Secondary Lower Punch Mechanism Available** — hydraulically operated with separate timing and stroke control — can be used to apply pressure, to eject compact, or to move core rod up and down during filling or ejection sequence.

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KUX
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6725 North Ridge Avenue
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Also builders of a full range of die casting machines . . . from 25 tons to 1000 tons in size.

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Permanent mold casting offers a wide choice of core materials. Shape is unlimited—surface finish variable depending on the part requirements.

use these
Design Tips
for lower costs
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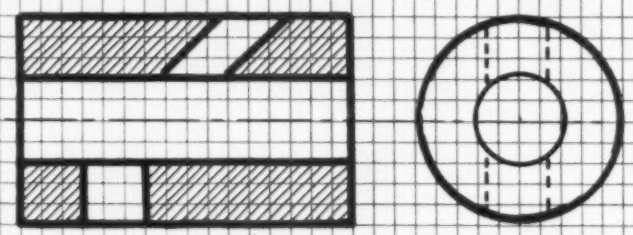
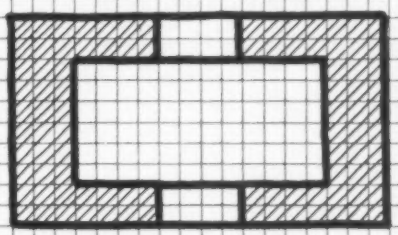
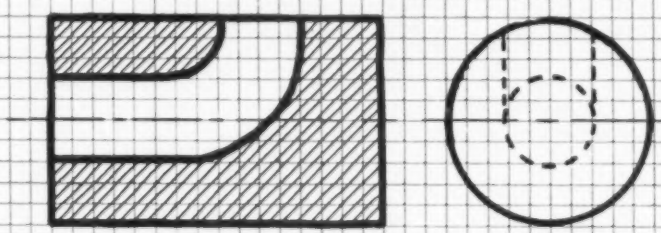


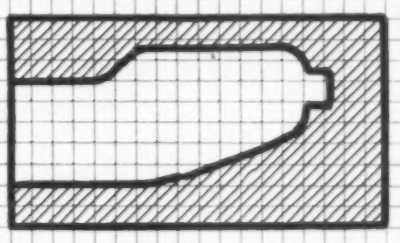
Three cores, all may be metal, one on mold parting.



Undercuts may be either metal, sand, shell or plaster, if metal, a collapsible core must be used.



Semi-permanent mold. Core is sand, shell or plaster.



Cored holes may be blind and of almost any configuration.

The surface finish obtained in cored holes will depend on the metal being cast and the material used to make the core. In aluminum casting the average and the best commercial finishes cast are:

Type of core	Average commercial finish, microinches	Best commercial finish, microinches
Metal	125	35
Sand	500	250
Shell	250	125
Plaster	125	50

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These are not just spotty identification colors. These are scintillating golds, yellows, blues, greens, violets, reds, brass and copper hues that will add glamor and sales appeal.

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DIE CASTINGS

FOUR PARTS, two stampings and two screw-machine items once used in a switch.

When you switch to die casting...

SINGLE ZINC DIE CASTING which replaces four parts.

FOUR...

Will Get You ONE!

"FOUR will get you one" is garbled gamblers' jargon that makes little or no sense to the veteran horse player.

But to a manufacturer switching from the use of four fabricated parts . . . to a single zinc die casting . . . it makes all the sense in the world.

And the payoff is good too!

Because the conversion to a single zinc die casting – using it instead of two screw-machine parts and two steel stampings – has cut production and material costs in half at the Chicago Coin Machine Division of Chicago Dynamic Industries. The new zinc die casting is a hub in a drum-type stepping switch used on an electrical switching mechanism.

And by die casting it, Chicago Dynamic wins such things as extremely close tolerances and excellent structural strength. Three assembly holes are cored, the shaft-bearing hole is cored to size, and three locating lugs are cast internally.

Critical dimensions are held as-cast to an over all tolerance of .005". Sides of the square sections must be held concentric within .003" to the bearing hole. The hubs are cast in a 4-cavity die at the rate of 220 shots an hour.

STEPS IN PRODUCTION OF DIE CASTING

1. Trim casting
2. Tap three assembly holes

DISCARDED STEPS USED TO MAKE 4-PIECE ASS'Y

Brass Hub Bearing

1. Machine shoulder on each end
2. Drill shaft hole
3. Ream shaft hole

Steel Flange

1. Stamp part
2. Punch four holes
3. Punch three locating lugs
4. Tap three securing holes

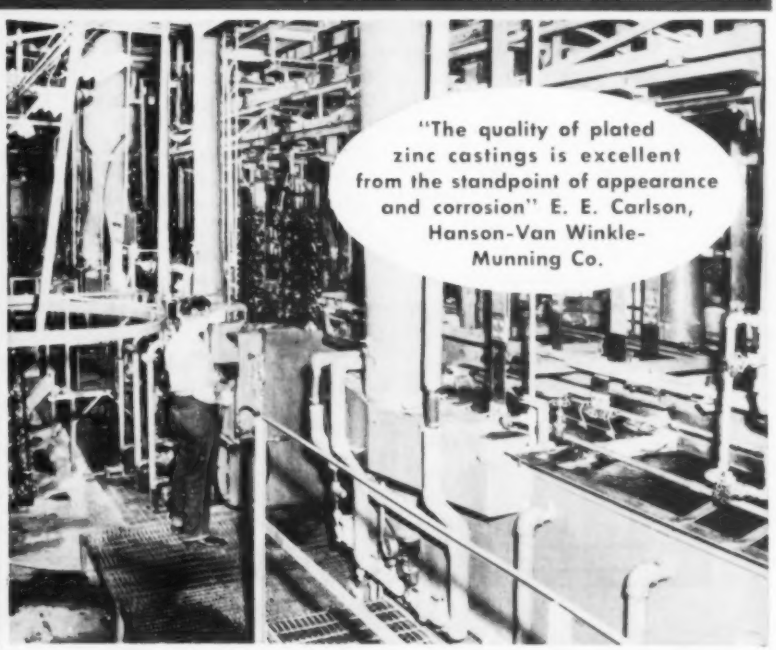
Brass Spacer — *Purchased*
Steel Washer — *Purchased*

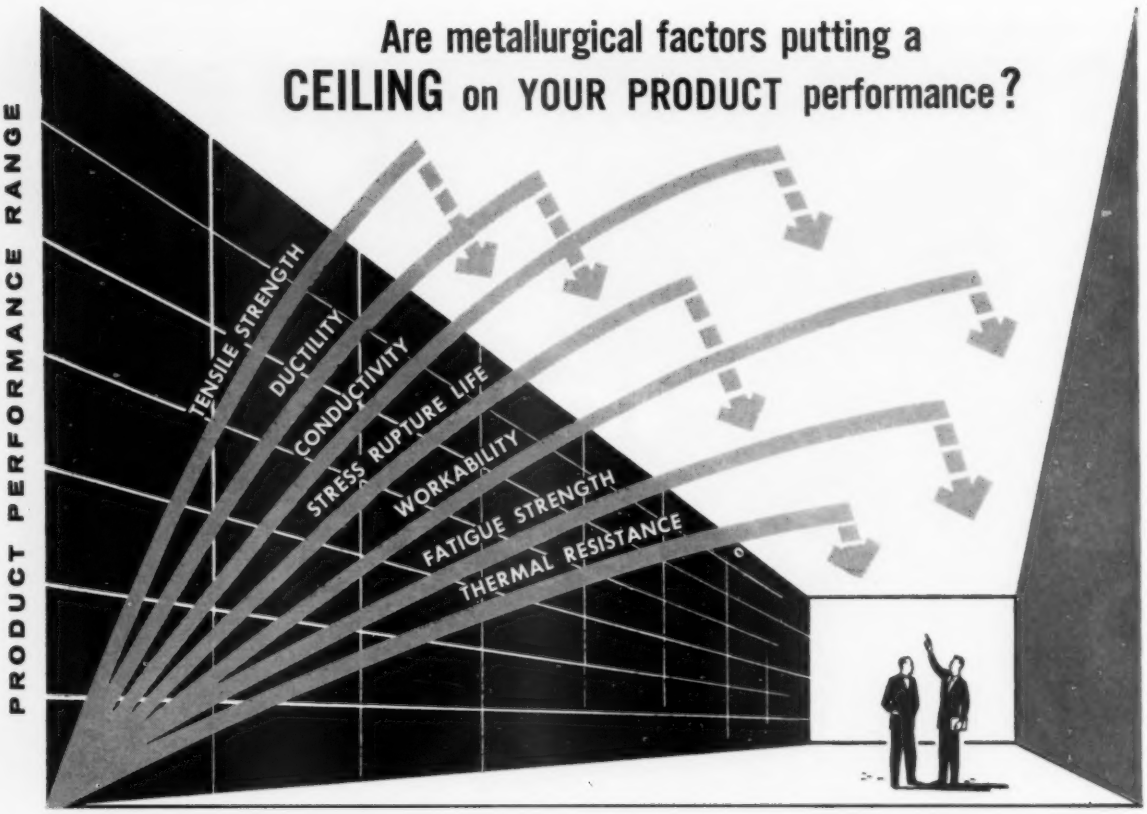
NOTE: Discarded assembly operations included such things as placing the large bearing-flange over one shoulder. It was secured by spinning the brass neck over the steel washer. The washer held the flange firmly when the rest of the assembly was mounted.

PMM

Finishing Section

The specialized finishing methods, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here. This includes all secondary operations which convert a raw casting to a finished product.


"The quality of plated zinc castings is excellent from the standpoint of appearance and corrosion" E. E. Carlson, Hanson-Van Winkle-Munning Co.



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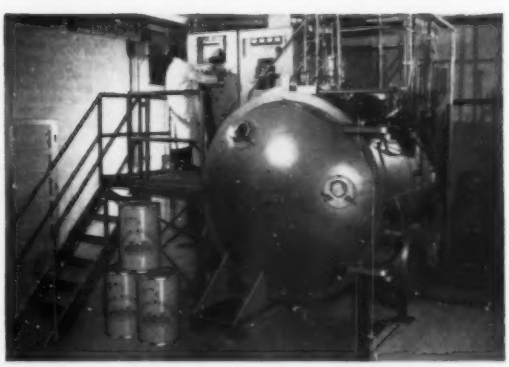
Vacuum melting has proven its superiority in providing alloys of extraordinary cleanliness — free from harmful inclusions and gases. Vacuum melting will produce alloys with improved fatigue life and thermal resistance, greater strength and ductility, better corrosion and abrasion resistance, higher electrical properties . . . alloys that are tougher, longer lasting . . . with the desirable characteristics to make new and better products.

Production or development . . . Cannon-Muskegon can exactly meet your requirements. Our metallurgists can analyze your problems and accurately determine how vacuum melting will serve you best.



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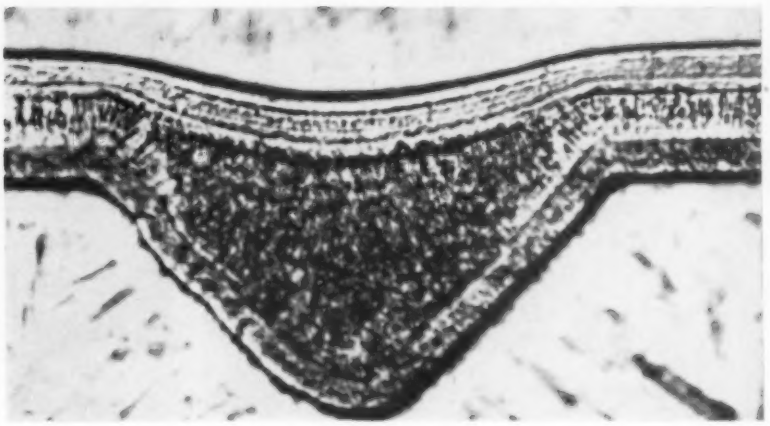


1 DUPLEX NICKEL may be used where the brilliance of chromium and its corrosion resistance are not required. On zinc, a copper backing is required.

Finishing Die Castings

Part VI: Plating

BY E. E. CARLSON*

THE plating of zinc base die casting is now an old industry which has gone through several stages where the finishing has been considered to be unsatisfactory until at present where the quality of plated die castings is excellent from the standpoint of appearance and corrosion.

Probably one-third of the die castings made are used in automotive trim where they are copper, nickel and chromium plated, and it is the severe outdoor exposure due to salts used in winter on roads and the changes in humidity and exposure conditions that have lead to poor corrosion resistance on many plated die castings.

Various factors involved in obtaining good corrosion resistant plating are:

CASTING QUALITY

The casting must be sound, free of cold shot and porosity near the surface. The "skin" or surface of the die casting is a layer of small grains which become progressively larger toward the center. The smaller grain size at the surface results in a harder outer surface. If, in polishing and buffing, this "skin" is cut through, porous areas are sometimes exposed.

*MANAGER OF ELECTROPLATING SECTION, HANSON-VAN WINKLE-MUNNING COMPANY

This can lead to blistering of the plated deposits. Sometimes porosity is noticeable on the "skin" of the casting, which will always result in areas of poor corrosion resistance, blistering and poor appearance after plating.

COLD SHOT

This results in streams of metal coming together in the die, which have become too cool to mix completely, resulting in a pattern which is porous where the streams of metal meet.

This will give porous areas which will show up after surface finishing and will result in pits, roughness or blistering of the deposits. Often cold shots are masked by the buffing operation but show up in the cleaning and acid dipping during the plating cycle.

SOLDER SPOTS

Caused by small droplets of metal splashing on the surface of the die and solidifying before the main body of the metal arrives.

Sometimes these spots will drop out during polishing or buffing and sometimes they are pulled out by the tension of the metal plated onto the die casting. This will result in blistering the final plated metal.

BLISTERS

It is possible for the die casting itself to have blisters on the surface. This is caused by the entrapment of gases near the surface of the casting. When metal is deposited over such a surface the tension of the plated metal will cause a lifting of the thin layer of zinc from the base of the casting.

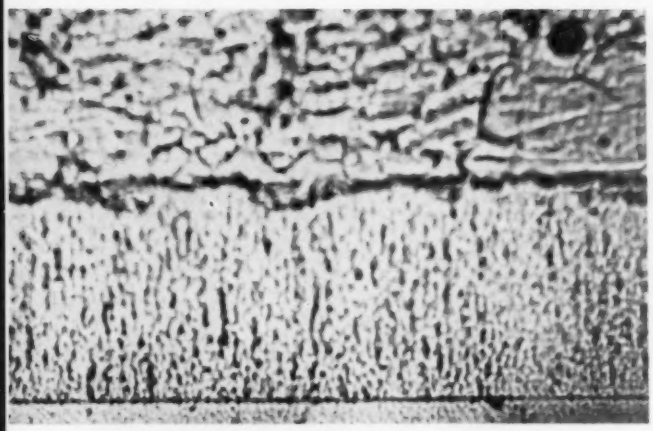
This type of blistering usually does not show up until after the plating operation. It can usually be distinguished from plating blisters because if it is opened up, a thin layer of zinc will adhere to the under surface of the plated metal. This type of blistering is caused by too high a temperature on the die during casting.

SURFACE FINISHING

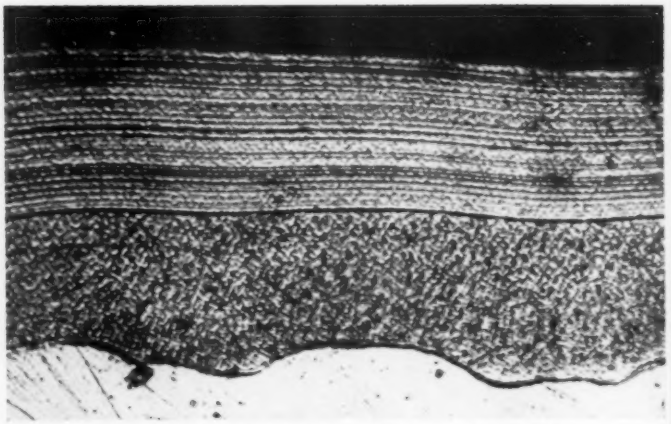
The size of the casting and the final finish required determines the method used for preparing zinc die castings for plating. If the part is small enough, parts can be more economically finished by barrel finishing methods.

Most automotive trim parts are fairly large and are polished and buffed either by hand or automatic buffing machines after die trimming to remove flashing.

The buffing operations leave large amounts of buffing compounds on the work and in recesses of the parts, especially where auto-



2 THE COLUMNAR STRUCTURE is characteristic of semi-bright nickel and the banded structure of bright nickel.



3 A SINGLE BATH may be used to produce a duplex nickel structure by variation in air agitation.

TABLE I
TYPICAL CYCLE USED IN PLATING

1. Emulsion soak, 160° F –200° F, 1 minute 45 seconds.
2. Warm water rinse
3. Alkali soak, 1 minute 45 seconds
4. Rinse and spray
5. Power washer, 180° F, 1 minute 45 seconds.
6. Anodic cleaner, 160° F –180° F, 1 minute 45 seconds.
7. Rinse with top spray
8. Re-Rinse with top spray
9. Acid dip, 30-45 seconds
10. Rinse with top spray
11. Re-Rinse with top spray
12. Copper strike, cyanide copper, 120° F –140° F, 3 minutes
13. Bright copper plate, 16 minutes
14. Reclaim rinse
15. Cold rinse and top spray
16. Acid dip, 30 seconds
17. Bright nickel plate, 120° F –160° F, 30 minutes
18. Reclaim rinse
19. Cold rinse with top spray
20. Inspection station
21. Cathodic alkaline cleaner, 190° F –200° F, 2 minutes
22. Rinse with top spray
23. Acid dip, 30-45 seconds
24. Rinse with top spray
25. Chromium plate, 110° F –130° F, 3-4 minutes
26. Reclaim rinse
27. Rinse with top spray
28. Re-Rinse with top spray
29. Hot water rinse
30. Drying oven
31. Unload station
32. Stripper for removing chromium from racks, 3 minutes
33. Cold rinse

TABLE II
MINIMUM THICKNESSES

COPPER	.0004 "
SEMI-BRIGHT NICKEL	.0008 "
BRIGHT NICKEL	.0004 "
CHROMIUM	.00001"

matic buffing machines are used. Since zinc die castings are highly reactive to alkalies and acids, the bulk of the cleaning to remove the heavy surface contamination must be done in solutions which will have good cleaning properties but will not attack the casting.

Vapor degreasing using trichlorethylene is effective in removing the bulk of buffing compounds, but it has the disadvantage that it leaves behind solid abrasives which are difficult to remove in the following steps of the cleaning cycle. Also, in large scale production this method is quite expensive and is difficult to adapt to conveyorized plating.

A typical cycle used in plating die castings on full automatic conveyors is shown in table I.

Most die castings are copper, nickel and chromium plated and the performance and quality of the plated part, provided the casting is sound, depends on the thickness of the plating.

In the past and in many cases today, the poor performance of plated die castings subjected to outdoor exposure has been due to deposits which were thinner than specifications called for.

There are other reasons for failure, such as, porosity, unsound castings, pitting, or porosity in the electroplated deposit itself, but the main difficulty has been due to lack of sufficient deposits.

The latest development in improving corrosion resistance of die castings used for outdoor exposure is to apply what is known as duplex nickel deposits over the copper. Some of the latest specifications seen in table II call for minimum thickness on significant surfaces.

The copper is applied by striking in a conventional cyanide copper bath for 2-3 minutes and then transferring to a bright cyanide copper bath where .0004" of copper is applied.

The semi-bright nickel is deposited from a solution which gives a smooth surface where the structure of the nickel is columnar. Following the semi-bright nickel, the work is transferred to a nickel bath which is fully bright. The parts, after rinsing, are then chromium plated, rinsed and dried.

The purpose of using duplex nickel deposits is to improve the corrosion properties of the over-all plating. It has been found that the corrosion resistance is decidedly improved over a fully bright single nickel plate which would be equiv-

alent in thickness to the thickness of the duplex coating.

The physical and chemical properties of the semi-bright undercoating are responsible for the improved corrosion. It has been shown that the semi-bright nickel is more passive than fully bright nickel layers and that cells are set up between the semi-bright and bright layers of nickel where there is sacrificial corrosion of the top layer of nickel.

That is, the bright nickel is anodic to the semi-bright undercoat. This results in fine pit like corrosion of the top layer of nickel.

The pits are usually very fine and do not detract too much from the appearance of the plated casting.

It has been shown that the thickness of the chromium deposit has a marked effect on corrosion. Accelerated tests on copper, nickel and chromium plated die castings have shown that .00002 inch of chromium gives superior results than the usual .00001 inch of chrome.

Another advantage of using duplex nickel coating is that better leveling can be obtained. Leveling is the ability of the deposit to eliminate or hide surface irregularities in the base metal.

From a practical standpoint, this means that the surface preparation does not have to be as good as for non-leveling deposits and can result in a saving in the preparation of the die casting for plating or will eliminate buffing the final nickel plate to hide surface imperfections and give good brightness to the final product.

Leveling can also be obtained by using cyanide copper solutions prior to nickel plating, in which periodic reverse current is used. (U. S. Patents 2, 451, 340 and 2, 451, 341; WESTINGHOUSE ELECTRIC CORPORATION) The use of periodic reverse current has the following advantages:

1. Good leveling (most cyanide coppers show no leveling properties)
2. High rates of deposition
3. Better deposit distribution.
4. Brighter deposits

This process is being used in plating certain types of zinc die castings which require a bright finish but because of designs and filigrees in the casting do not have flat surfaces requiring mirror bright surfaces.

Small castings which can be barrel finished to prepare the surface but on which the surface obtained is not as good as a buffed surface, can be plated with periodic reverse current copper so that the final chrome plate is nearly as good as a buffed surface.

The finish obtained on this type of part with periodic reverse copper plating cannot be obtained with conventional bright copper solutions.

A great deal of work is being conducted on improving methods for plating die castings, and with continuing progress, it is expected that finishes will be further improved with an accompanying reduction in cost in plating.

CASTLE APPOINTED TECHNICAL DIRECTOR

C. Heamon Castle has been appointed technical director of the ABRADO FINISH CORP. For the past 25 years, Mr. Castle has been primarily concerned with barrel finishing methods and equipment; he holds several patents on methods and processes for barrel finishing.

Mr. Castle will be responsible for the development of new barrel finishing methods and materials. He will be in charge of the new company laboratories.

GRIND
POLISH
BUFF
DEBURR

with a Hammond ROTARY AUTOMATIC

SEND SAMPLES and we'll show you how much you can speed production and cut costs.

Model "K" Hammond Automatic Finishing Machines are made in 34", 46" and 62" table sizes. These models are either continuous or for indexing at 150 to 1700 indexes per hour. Head styles include floating, non-floating with 3 H.P. to 20 H.P. range. Also available are attachments for converting heads from buffing to abrasive belt polishing. The Hammond Model "K" will speed up your grinding, polishing, buffing, brushing and de-burring operations. Send us samples and learn how much you can speed them up.

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Hammond Machinery Builders INC.

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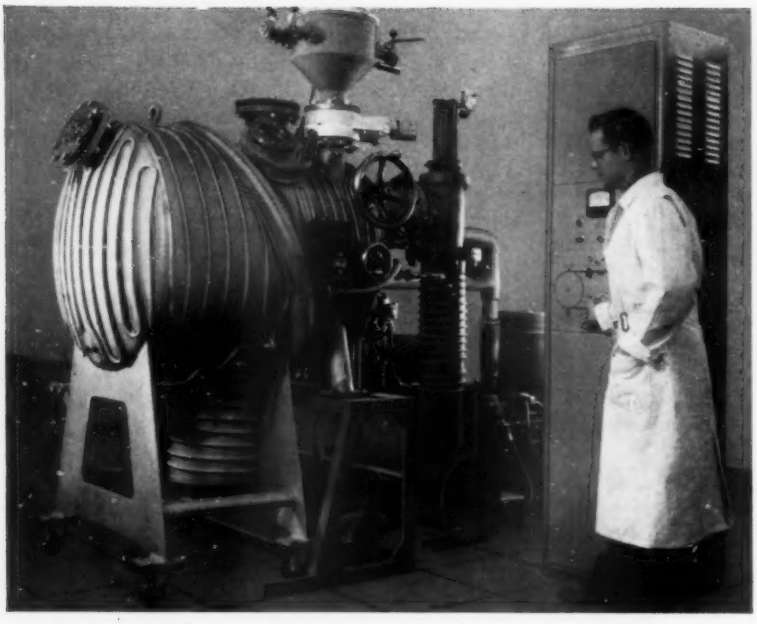


Process observation, alloy additions, pouring, temperature and process readings, high frequency control, valve sequencing—all focus around one center of operation.

For precision casting

a high-vacuum furnace for lab and pilot plant

CEC's 5 to 50 pound melting and casting furnace offers:

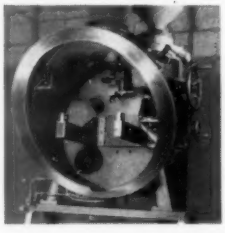
Three-way casting: Melts of 5, 12, 17, 30, or 50 pounds can be cast in single or multiple molds—or (with adaptation) centrifugally.

Ease of materials handling: All parts of the furnace interior are within arm's reach. The oblique angle flange connecting the stainless steel chamber sections provides unusual vertical clearance for removing molds directly. A deep water-cooled mold well provides 33" under the crucible lip for pouring bar-type ingots. Electric feedthroughs are provided for mold heating.

Complete controls: The basic furnace includes a manual bridge-breaker, a feeder and alloy cup mechanism, and a nonfogging sight tube for optical pyrometry. Pneumatic line valves are interlocked and controlled from central panel for safe, sure operation. It's easy to add a sampler, thermocouple, and equipment for semi-continuous operation.

Ample pumping: A 2-stage diffusion-ejector pump quickly brings the compact system to the low micron pressure range, with ample reserve capacity to handle gas loads generated by alloy additions, deoxidation, and pouring.

Write for illustrated Bulletin 4-30, which lists complete specifications, accessories, and design features of this remarkably versatile furnace.



Interior view of compact furnace shows alloy addition devices and crucible trunions.

Consolidated Electrodynamics

Rochester Division, Rochester 3, N. Y.

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES

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ALLIED RESEARCH & WAGNER BROTHERS MERGE

The entire metal finishing operational assets and products of WAGNER BROS., INC. have been acquired by ALLIED RESEARCH PRODUCTS, INC. The move is expected to strengthen Allied's position in the metal finishing field. It will allow them to offer their customers a complete line of chemical and electro-chemical finishing processes, anodes, rectifiers, automatic equipment and supplies.

Manufacturing will be carried on in Baltimore and Detroit with administrative offices in Baltimore and branch offices in Detroit. H. C. Irvin will continue as president of the enlarged operations and J. R. Wagner will become administrative assistant to Mr. Irvin.

Wagner Bros., Inc. will be completely divorced from the metal finishing field, but will continue to operate the Automatic Molding Machine Co., Inc.

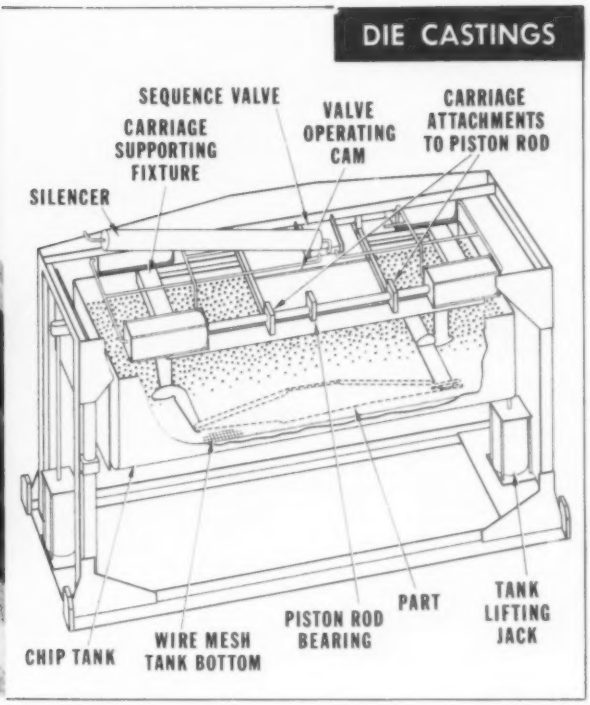
WHEELABRATOR ADDS BARREL FINISHING, WET BLAST DIVISION

Formation of a new barrel finishing and wet blasting division of Wheelabrator Corporation, Mishawaka, Indiana, has been announced by Wheelabrator President, James F. Connaughton.

The 50-year old company, manufacturers of airless blast cleaning equipment, dust control systems, and steel abrasives, has made wet blasting machines for the past eight years. By acquiring the assets of Crandall Engineering and Manufacturing, Inc., Vicksburg, Michigan, the company adds a complete line of barrel finishing machines. Manufacturing and sales headquarters will be in Vicksburg. Complete experimental and demonstration laboratories will also be maintained there.

General manager of the new division will be Jacob A. Schmidt, Jr., secretary-treasurer of the parent company. George H. Lieser will be wet blast product manager and Roy T. Romine will be barrel finishing product manager and chief engineer.

IDENTICAL SPAR BOOMS before and after the finishing operation. Boom at left has raw, machined surface. Boom on right has matt-satin finish produced in ram-action machine.



ROTO-RAM MACHINE is illustrated in this isometric drawing. As it is seen here, the machine's chip tank is set in the "Up" position. Other parts are labeled.

Finishing Big Parts in Barrels

HIGHLY stressed parts, particularly hardened steel ones which are notch-sensitive, must have all machining marks removed. Sharp corners, scratches, machining grooves, etc., all act as stress concentration points; none of them can be tolerated.

Barrel finishing is a well established method of removing stress-risers.

For small parts the methods of barrel finishing are well worked out. As the part size increases, larger barrels can be built, but an economical limit is always reached where the cost of super-sized barrels and the cost of operation becomes too high.

This problem is particularly true of the aircraft industry. The spar booms shown in the photograph are a good example. These parts are about five feet long and weigh from 50 lbs. to 52 lbs. apiece. They can not be finished economically in a rotating barrel.

For work of this general type, the Roto-Finish Co. has developed a modification of the standard barrel. In this machine, the barrel, or chip container is stationary and the work pieces are moved; but movement is not rotational.

The parts are fixtured and movement between them and the chip-mass is secured by a reciprocating movement in a horizontal plane. Frequency of the stroke can be varied from zero to 60 cycles per minute and length of stroke can be varied between zero and 10 inches.

By the proper positioning of the work load, all surfaces can be subjected to the abrasive action of the media. Some pieces have guarded areas that can only be reached if the parts are rotated occasionally. This is done by stopping the machine and turning the fixtured parts. Rotation cannot be accomplished while the parts are immersed in the chip-mass.

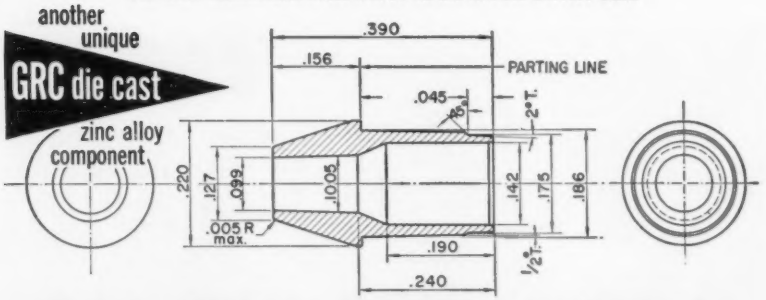
On the illustrated spars, the average surface roughness is 150 micro-inches center-line average in the as-machined condition.

After one hour in the reciprocating finishing machine the average roughness is only 30 micro-inches. No attempt is made to polish the parts, but to eradicate surface marks that can create high local stress-levels and to produce a uniform radius on all corners. The finished surface has a satin matt appearance that is smooth.

According to engineers who designed the machine, all the varieties of finish that can be secured in a rotating barrel can be gotten in this machine.

For more information circle No. 15 on the Reader Service Card

another unique GRC die cast zinc alloy component



GRC CUTS TINY BUSHING COST TO $2.00/M

Die cast by GRC in zinc alloy in a single automatic operation, this former screw machine part for a ball point pen, now costs little more than $2.00 per thousand in lots of a million. Each bushing is uniform, clean and accurate—no cut-off marks, no burrs, no secondary trimming and no scrap loss. Typical of the production economies and wide design latitude which GRC's exclusive patented methods have made possible on parts "no bigger than your thumbnail." (Maximum size is 1¾" long, ½ oz.; no size too small).

Simple or complex, let GRC's unique techniques go to work for you . . . on tiny die cast *and plastic molded* parts made to order . . . on their wide variety of standard parts available in stock—die cast wing and round head thumb nuts and screws, cap nuts, molded nylon screws, gears and pinions—you'll be glad you did.

Write, wire, phone TODAY for bulletins, spec sheets and prices. Send prints or specs for quotation.

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PMM BOOK REVIEWS

THE SOLIDIFICATION OF CASTINGS, By R. W. Ruddle, Institute of Metals, London, England. Price $6.50

This new revised edition critically surveys and summarizes the researches carried out in the field of solidification of castings. The great amount of research, since publication of this book six years ago, has necessitated this complete revision.

Chapter I deals with the principal experimental methods used in studying the solidification of castings. The qualitative aspects of the mechanism of freezing metals and alloys are presented in the second chapter. The mathematics of the flow of heat in solidifying castings and molds is presented in Chapter III. Other chapters deal with experimental work on the flow of heat in sand and ingot molds; Freezing rates in sand and chill castings; The effects of freezing

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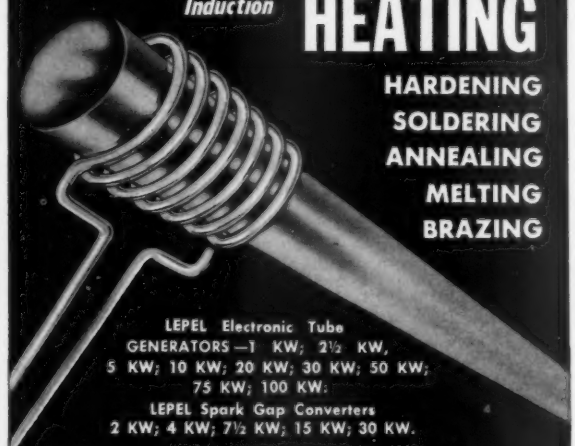

LEPEL Electronic Tube GENERATORS—1 KW; 2½ KW, 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.

LEPEL Spark Gap Converters 2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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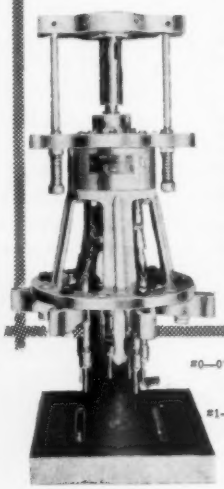
ERRINGTON

UNIVERSAL JOINT ADJUSTABLE TAPPING & DRILLING HEAD



Here's another hi-speed production tool from Errington. This dependable tool is adjustable to any pattern of holes . . . is available with 4 or 6 spindles. Positive clutch drive and reverse. Head made of the best grade sand Cast Aluminum with hardened and ground gears and spindles (made in one piece). Full grooved ball thrust bearings at all thrust points and Oilite bronze radial bearings. *Remember to do more . . . better . . . faster . . .* rely on Errington Hi-Speed Production Tools.

#0—0" to ¼" Tap Capacity
Min. centers 11/16"
Max. Pattern 5¼"

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Min. centers 1½"
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LESS THAN ½ MINUTE TO CHANGE HEAD FROM DRILLING TO TAPPING OR TAPPING TO DRILLING

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rates on the shape and size of the casting.

Two appendices are included: the first lists and discusses information available on the high-temperature thermal properties of metals and mold materials; the second consists of tables of two of the mathematical functions used in computing heat-flow rates in castings and molds.

GRAY IRON CASTINGS HANDBOOK, Edited by Charles F. Walton, Gray Iron Founders' Society, Cleveland, Ohio. Price $10.00

This is the first complete handbook written on gray and ductile iron castings. The 620 pages contain the latest information on how to successfully and economically design, purchase and use gray, ductile, white and high alloy iron castings. Included are 411 illustrations and graphs, 64 tables and bibliographies, and a glossary of foundry terms.

The design engineer, buyer, production executive, heat treater and management executive will find the handbook useful. The handbook contains sections on (1) the design of gray iron castings; (2) specifying and purchasing gray iron castings; (3) physical properties of gray, ductile, white and high alloy iron; (4) heat treatment; (5) welding, joining and cutting; (6) machining and grinding; (7) metallic and non-metallic coatings; (8) functional and economical advantages of iron castings and (9) a review of the history of gray iron.

SMITH BOLTON NAMED TREASURER OF PMPMA

THE POWDERED METALLURGY PARTS MANUFACTURERS ASSOCIATION, trade organization for the custom fabricators of sinterings, has elected Smith Bolton, president of U. S. Graphite Co., as treasurer. Bolton's election took place at the Pittsburgh meeting of the board of directors last May 20.

YLVISAKER NAMED GENERAL MGR., PARKER-KALON

PARKER-KALON DIV., GENERAL AMERICAN TRANSPORTATION CORP. has appointed William T. Ylvisaker as General Manager. He will succeed Eli Ogulick, who has resigned.

now you can get this brilliant finish directly on zinc die castings!

No electroplating--no mechanical finishing!

PART AS CAST

TREATED WITH NEW IRIDITE

NEW IRIDITE® (Cast-Zinc-Brite)

brightens zinc die castings by chemical polishing, protects against corrosion

NOW, FOR THE FIRST TIME you can get a brilliant, decorative finish directly on zinc die-cast parts . . . without mechanical finishing, without electroplating! The luster is provided by the *chemical polishing* action of new Iridite (Cast-Zinc-Brite) solution. Even surface blemishes, such as cold shuts, are brightened by this new process. No electrolysis. No special equipment. No specially trained personnel. Just a simple chemical dip for a few seconds and the job is done. And, this new Iridite has been *tested and proved* in production.

CORROSION RESISTANCE, TOO! New Iridite (Cast-Zinc-Brite) provides exceptional corrosion resistance for bright-type chromate finishes . . . also guards against blueing or darkening by eliminating zinc plate formerly required in bright chromate finishing of zinc die castings.

AS A BASE FOR ELECTROPLATING—Lower mechanical finishing costs are possible where plated finishes are *required* since the brightness provided by this new Iridite may be sufficient.

LET US SHOW YOU what Iridite (Cast-Zinc-Brite) can do for you. Send us at least a half-dozen typical zinc die-cast parts for FREE PROCESSING for your own tests and evaluation. Or, for immediate information, call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified 'phone book. *IMPORTANT: when you give us samples for test processing, please be sure to identify the alloy used.*

Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET
BALTIMORE 5, MARYLAND

***Manufacturers of* IRIDITE®, IRILAC™, ARP® Brighteners and Plating Chemicals—West Coast Licensee: L. H. Butcher Co.**

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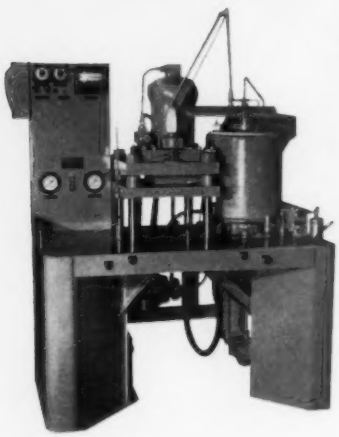
For more information circle No. 25 on the Reader Service Card

LEYDEN WAX INJECTORS

Completely Hydraulic • *Three Models Available*



Over 200 machines in the field have proved their superiority. Write for complete specifications and features of the Leyden Models vertical platen—side or center injection—horizontal platen—center injection.

LEYDEN wax injection machines are the last word in the field of wax injection. They are the result of years of research and experience.

SOME EXCLUSIVE FEATURES

- Completely hydraulic—operated by self-contained power unit.
- Two hydraulic pumps—one for clamping and one for injection.
- Clamp and injection pressure independently adjustable.
- Entire wax unit heated by circulating oil.
- Thermostatically controlled, electrically heated nozzle—optional.
- Temperature controlled to plus or minus ½° F.
- Agitator spans full diameter of the pot, keeping wax mixed uniformly.
- Universal movement of nozzle to facilitate misaligned dies.

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Get the results you want from DIE CASTING...

When you decide to use die cast parts, you expect, definite *results* in terms of *benefits* reflected in your manufacturing operations, or in your finished products. Milwaukee engineers and technicians, backed by the complete facilities of the modern Milwaukee plant, are qualified by training and experience to give you the results you are looking for . . . and more!

When you send your prints and "specs" to Milwaukee, you often get more than a quotation. You may get suggestions and proposals, when deemed useful, that will give you all the results you are looking for plus the *extra benefits* which the die casting process can give you.

Milwaukee operates under the Certified Zinc Plan of the American Die Casting Institute.

A partial list of RESULTS you can expect when you specify MILWAUKEE DIE CASTINGS
★ Less Machining
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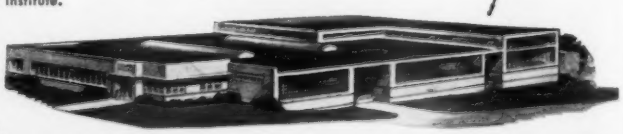

MILWAUKEE DIE CASTING COMPANY

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Established 1909

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pmm OPPORTUNITIES

jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding, 812 Huron Rd., Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

EQUIPMENT

WANTED

Zinc End for Cleveland 400 Die Cast Machine. Reply to Box No. 8158.

FOR SALE

Kux BH 30 Die Cast Machine with 4" bars—1943 Model.

Stroman Model DC-700 Double Chamber Alumium Reverberatory Furnace with 2802 Centrifugal Blower—1956 Model.

Dorsey 300 pound capacity double chamber Aluminum Reverberatory Furnace—1956 Model.

Misc. sizes of NEW Cold Chamber Wells for Cleveland 400 Machines. Standard 2 piece type.

MAKE OFFER

Reply to Box No. 8258.

FOR SALE — Die Casting Machines

2 — 150-ton Reed-Prentice
1 — 200-ton Reed-Prentice
5 — 400-ton Cast Masters
1 — 400-ton Cleveland
2 — Reed Vac-U-Cast

Other miscellaneous machinery.

Address inquiries or call Mr. Arnold Williams, 4518 Lakeside Ave., Cleveland 14, Ohio Henderson 2-2626.

FOR SALE

1 — Workhorse Die Casting Machine complete with all controls.

Helfrich Die Casting Co.
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POSITIONS WANTED

DIE CASTING GENERAL MANAGER

Responsible for sales, manufacturing and financial success of new zinc and aluminum die casting plant of 75 employees in Southern New Jersey. Box No. 8358.

British Die Casting Graduate Engineer, wide experience over eleven years in British and American production methods. Now respon-

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POSITIONS OPEN

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Prepare cost estimates from blueprints and standard data for wide variety of Aluminum Sand Castings for bidding purposes.

High degree of interest in mechanics with some experience in machine and/or tool design desired, since estimator also assists in design of pattern equipment for production.

A good position with a company established in 1875.

Write — Oberdorfer Foundries, Inc.
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Syracuse, N. Y.

FEDELES TO REPRESENT LATROBE STEEL CO.

Mr. P. E. Fedeles, formerly a metallurgical engineer in the Standards and Inspection Dept. of LATROBE STEEL CO. will represent the company in the Western Michigan territory as a sales engineer to the metalworking industry.

NARDA ULTRASONICS TO EXPAND ITS FACILITIES

NARDA ULTRASONIC CORP., manufacturer of ultrasonic devices and the "SonBlaster" ultrasonic cleaning equipment has purchased a new building in Westbury, L.I., N.Y. The new building will provide the company with an additional 16,500 sq. ft. of manufacturing space and ample employee parking space. The main offices of the company will remain in Mineola, N.Y.

SYMPOSIUM ON BERYLLIUM METAL HELD

THE BERYLLIUM CORP. held a Symposium on Beryllium Metal last June 12. Nearly 100 men, representing over 60 different firms as well as Army, Navy, Air Force, and Defense Department representatives attended.

The symposium was the company's answer to its offer to share knowledge about beryllium with companies and individuals who have a legitimate interest in the little known metal. Subjects covered at the meeting were basic information about the metal, methods of production, machining, casting, forming, uses, costs and toxicity.

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TRIM DIES

- *shot sleeves and tips*
- *die casting machine parts*
- *designing and engineering*

OKEE *Die and Tool*

8100 N. Central Park Ave., Skokie, Ill.
Orchard 4-6046 **(Suburban Chicago)**

11 Remet
POWDERED METAL PARTS
now go into
DE WALT POWER SAW
and attachments

- This Remet collar reduced part cost 80%. Formerly a precision casting in beryllium copper, it is now a Remet copper infiltrated powdered iron part. Advantages led to DeWalt specifying 11 different powdered metal parts by Remet.
- DeWalt now offers greater saw accuracy thru maintenance of closer tolerances.
- "You can depend on Remet for better service, fast delivery," states A. C. Wedge, V.P., Mfg., DeWalt Div., American Machine & Foundry Company.

FREE, NEW BROCHURE "How to Cut Precision Parts Costs with the Remet Powdered Metal Process" gives complete information.
Send for your copy today.

Remet
REESE METAL PRODUCTS CORPORATION
537 Howard Ave., Lancaster 10, Penna.

Gears • Pinions • Cams • Ratchets
"Oilless" Bearings • Bushings • Machine and Structural Parts in
COPPER • BRASS • IRON • ALLOY
STEEL • NICKEL SILVER • COPPER
INFILTRATED IRON

For more information circle No. 41 on the Reader Service Card

For more information circle No. 33 on the Reader Service Card

You save space and weight with the

NEW SELF-LUBRICATING

SPLIT THRUST BEARINGS

National split thrust bearings are light, take little space. Assemble them quickly to hold against rotation and high thrust. Eliminate bulky, heavy threaded washer-and-nut or set-screw collar assembly.

(Patent Applied For)

WRITE TODAY for illustrated folder and data sheet. You'll be amazed at the money you save! National split thrust bearings will be made in standard shaft sizes from .250 to 3.00.

POWDERED METAL PARTS · NATIONAL MOLDED PRODUCTS INC. · PRECISION ENGINEERED

NATIONAL

MOLDED PRODUCTS, INC.

ST. MARYS, PENNA.

KURT WEINBERG RETIRES AT INTERNATIONAL MINERALS & METALS

International Minerals and Metals Corporation has announced retirement of Kurt Weinberg as senior vice president in charge of sales and as vice president in charge of sales of National Zinc Company, Inc., its fully owned subsidiary.

Mr. Weinberg will continue as consultant to the Corporation.

Arthur J. Gervais has been appointed general sales manager of International Minerals and Metals Corporation and National Zinc Company, Inc.

Mr. Weinberg has been with International Minerals and Metals and its predecessor company, since 1909. He was elected a vice president in 1948.

During World War II and the period thereafter, Mr. Weinberg served in Washington on committees of the NPA, OPS, DMPA and the Munitions Board.

Mr. Gervais joined International Minerals and Metals Corporation January 1, 1948.

Richards

DOUBLE-IMPRESSION

MASTER-MOLD

MASTER-MOLD WORKS FOR YOU to bring overhead and operating costs down to a realistic level. **MASTER-MOLD** can save you up to 70% because this new technique eliminates expensive die sets and other costly equipment — slashes set-up time, labor costs . . . **handles two jobs at once.**

Short runs can be handled profitably! Short runs, long runs can be combined, run together — doubling your machine capacity!

Now you can add to your customers the many small manufacturers and experimental workers who cannot bear the cost of conventional die-casting methods.

. . . write for complete information, or order direct.

RICHARDS TOOL AND MOLD CO.

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For more information circle No. 43 on the Reader Service Card

INCREASE YOUR PRODUCTION — *Reduce your costs with*

DORSEY PISTON AND CYLINDER LUBRICATOR

for aluminum cold chamber die casting machines

- SAVE LUBRICANT
- PRECISE LUBE CONTROL
- REDUCE DOWN TIME
- FEWER REJECTS
- INCREASE PLUNGER AND CHAMBER LIFE

• Write now for literature, full details and prices . . .

WESTBROOK MFG. CO.

P.O. Box 231 — St. Joseph 2, Michigan

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NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

HENRY HAUSNER AND EDWARD KENNEY TAKE POSTS WITH CHARLES HARDY ORGANIZATION

Two leading figures in the field of powder metallurgy have been appointed to key posts with CHARLES HARDY, INC. An announcement from corporation president, Chalmers Dale, names Henry H. Hausner as scientific advisor on powder metallurgy development and Edward C. Kenney as vice president.

Internationally known for his work on powder metallurgy and on nuclear reactor components, Dr. Hausner is adjunct professor of metallurgy at the Polytechnic Institute of Brooklyn. He is active as a consultant on nuclear engineering problems in this and foreign countries and has contacts with the Atomic Energy Commission on powder metallurgy materials and processing.

Appointment of Dr. Hausner is expected to advance the company's current work on new metal powder materials and to accelerate research into new applications.

Mr. Kenney comes to the company after 20 years with Ekstrand and Tholand, Inc. where he has been active in sale of sponge iron powder. He will manage all metal sales activities of the company whose principal business is supply of all types of metal powders.

NEW EXPORT MANAGER

Robert C. Hiltbrand has been named manager of export sales for THE ELECTRIC FURNACE CO. He joined the company in 1938.

WABASH SMELTING GOES INTO PRODUCTION UNDER NEW MANAGEMENT

Headed by new stockholders, and with a new management team, WABASH SMELTING INC. began production of secondary aluminum alloy ingot in July. The plant in Wabash, Ind., was expected to reach one million pounds output per month of foundry grade ingot immediately.

New president named by the board of directors is David H. Thakar, with Meyer Ruchman as executive vice president and George A. Nagel as vice president.

Mr. Thakar was previously vice president of Alloys & Chemicals Manufacturing Co. of Cleveland, Ohio. Mr. Ruchman is also president of Indiana Rolling Mill Baling Corp. and has 35 years experience in the scrap metal field. Mr. Nagel was plant manager for Alloys and Chemicals prior to joining Wabash.

Plant metallurgist is George F. Veverka, formerly with Rockwell Manufacturing Co.

HELI-COIL EXPANDS PLANT

Work has started at the HELI-COIL CORP. on an expansion program aimed at the renovation of administrative, research and engineering offices.

CERAMIC SHELLS, VACUUM ALLOYS, AIRCRAFT USES STUDIED AT INVESTMENT CASTING MEETING

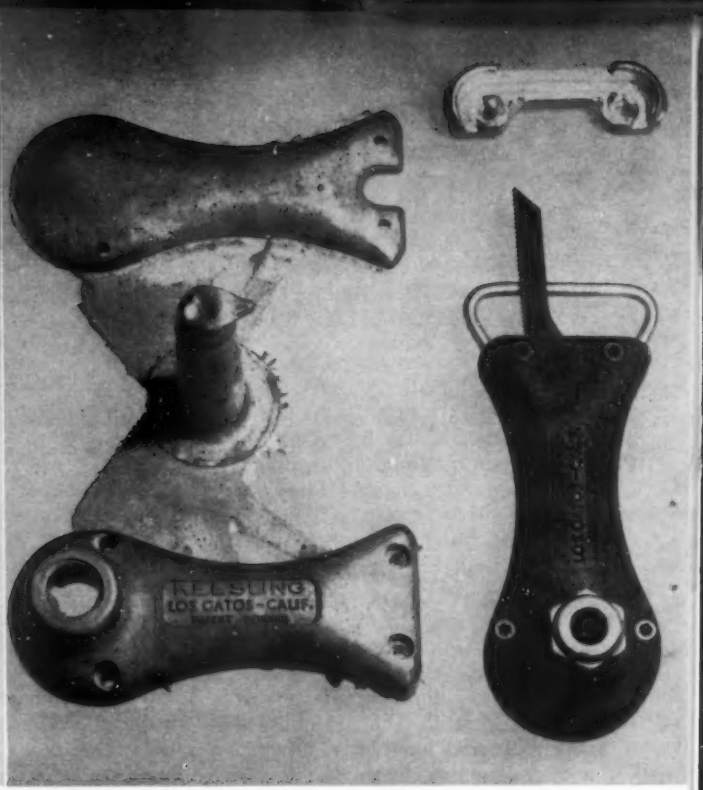
Four different systems of making ceramic shells for investment casting were eyed by the Investment Casting Institute at its Spring Technical Meetings in Muskegon, Mich., recently. Hottest topic was the thin-shell techniques for making castings. A panel led by Dr. Jack Keverian of General Electric Co. brought ICI members up-to-date on new materials and techniques.

The well-attended sessions got into serious study of vacuum alloys, investment castings in airframes and missiles, how to design castings for the ultimate in load-carrying, quoting for profit, and problems and techniques in dipcoats.

Dr. Richard A. Flinn of the University of Michigan chaired the technical sessions, with 23 engineers, metallurgists and other specialists participating in the panels and addresses.

Fall meeting of the Institute was announced for November 11-13 at New York's Hotel Roosevelt.

UNDERSIDE of zinc die castings seen at top of photo as they come untrimmed from the die; and below as they appear when finished and ready for assembly. Saw it open.



TOPSIDE of castings. At left side of photo are the castings newly ejected from the die. Beside them is assembled saw. Nearby is a small, die cast attachement.

Pick the Right Alloy to Solve Casting Problems!

SCHOLER BANGS, WESTERN EDITOR

TOM Keesling, a California tool design engineer, needed a metal cutting saw that would "cut like the devil" under all sorts of seemingly impossible conditions. The trouble was that he couldn't buy one; so he invented one.

The saw had to have a small, thin blade that would operate at high speeds to cut thin sheet metal. It had to be extremely manuverable to get into small spaces and turn sharp corners. It had to be just a comfortable handful to hold and above all it had to be modestly priced.

Now the drive mechanism was relatively simple. A high speed ¼" electric or air drill would be fine. To change the rotary motion to reciprocating motion wasn't much of a problem, even holding the size down was not so difficult. But when Keesling started out to put a case around his little mechanism he really ran into trouble.

The way the saw was designed, the case took the full stress developed when the going was tough and when the saw stalled. What's more, all of the mounting and positioning lugs, bosses, etc. had to be integral parts of the case.

Plastics were out — they just aren't strong enough and if the saw were dropped from any height they broke into many pieces.

Sand castings were much too expensive by the time they were ready for assembly.

Die castings seemed to be the only answer. Because there are sharp transitions from very thin sections to rather heavy ones and also to hold the cost down the parts had to be zinc die castings.

Now most zinc die castings are in alloy B 86-53T, composition AC40A (No. 3 zinc die casting alloy) but castings made in this alloy just wouldn't take the gaff. So the foundry turned to the orphan of the die casting industry, alloy B 85-53T, composition AC43A (No. 2 zinc die casting alloy). Most engineers have forgotten about or never heard of this alloy. What's more, not very many foundries will cast it. But composition AC43A has from 2.5% to 2.5% copper and this high copper adds strength and toughness to the castings.

True, it's a bit more difficult to cast and because it's a lot harder is more difficult to machine. There's one big advantage though, as-cast, this alloy has a thicker, denser and harder chilled skin than almost any other castable non-ferrous alloy. This made all the difference.

"Now with the case in this orphan alloy we get all

Continued on page 51

of the properties we want and need," Keesling says. "The case stands the 35 ton pressure needed to press in the bushing for the rotating shaft. The reciprocating shaft doesn't need a bushing and surface finishing is easy. What's more, this little unit will stand all the abuse that comes its way in the average shop."

JOHN D. MACKENZIE ELECTED PRESIDENT OF AMERICAN SMELTING

J. D. MacKenzie has been elected President of AMERICAN SMELTING AND REFINING COMPANY. R. W. Vaughan, formerly President, has been elected Vice Chairman of the Board.

Mr. MacKenzie has come up through the ranks from a chemist and metallurgist at the Company's Utah facilities, which he joined in 1920. During his 38 years with Asarco, he served as manager of several smelters and refineries in the United States and as a consultant to the Peruvian operations.

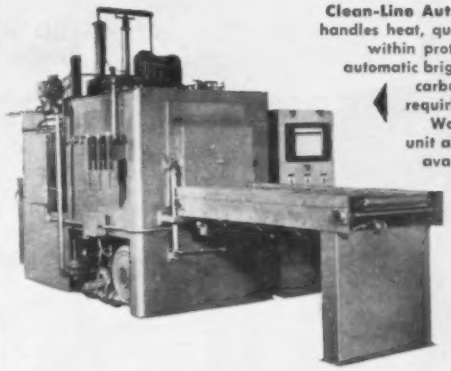
OFFICERS ELECTED FOR ASTM

New national officers have been elected for the 1958-59 year for the AMERICAN SOCIETY FOR TESTING MATERIALS. They are:

Kenneth B. Woods, Head, School of Civil Engineering and Director, Joint Highway Research Project, Purdue University, has been elected President. A. Allan Bates, Vice-President of Research and Development, Portland Cement Association, has been elected Vice-President. Frank L. LaQue, Vice-President and Manager, Development and Research Division, The International Nickel Co., Inc., will continue as Senior Vice-President.

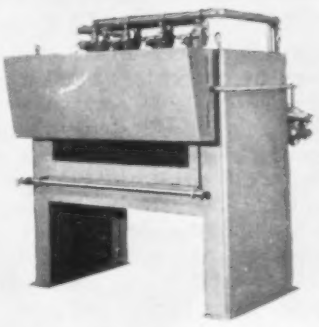
Elected for three-year terms on the Board of Directors were the following: Paul A. Archibald, Chief Metallurgist at Standard Steel Works Division of Baldwin-Lima-Hamilton Corp.; William L. Fink, Chief of the Physical Metallurgy Division of the Alcoa Research Laboratories; Harry M. Hancock, Manager, Product Control Department, Atlantic Refining Co.; Lawrence A. O'Leary, Head, Chemical Engineering & Research Dept., W. P. Fuller & Co.; and Alfred C. Webber, Senior Supervisor, Experimental Station, E. I. du Pont de Nemours & Co., Inc.

HEVI-DUTY ANNOUNCES
the addition of fuel-fired furnaces to its line



Clean-Line Automatic Heat Treating Unit handles heat, quench and draw cycles — all within protective atmosphere. Ideal for automatic bright hardening, carbonitriding, carburizing and other operations requiring temperatures to 1850°F. Washer, atmosphere tempering unit and atmosphere generator are available for a complete system.

Melting Furnaces — rigid or tilting types, manual or power-operated. Included are *crucible furnaces* and *dry hearth furnaces* for melting aluminum and other soft metals.



Forging Furnaces include adjustable slot forges and rod end forges with operating temperatures to 2200°F.

Hevi-Duty has added to its well-established line of electric heat treating furnaces, a complete range of quality *fuel-fired* furnaces for heat treating, melting and forging, through the purchase of the Industrial Furnace Division of Eclipse Fuel Engineering Company, Rockford, Illinois.

Hevi-Duty will manufacture and sell all types of furnaces formerly built by Eclipse and will provide service and replacement parts for any Eclipse furnaces now in operation.

The acquisition will enable Hevi-Duty to better serve the growing needs for industrial heat. For more information, call your nearest district office or write Hevi-Duty Electric Company, Post Office Box 563, Milwaukee 1, Wisconsin.

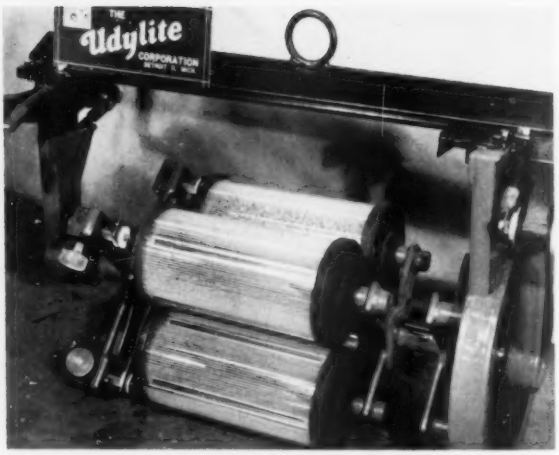
- **Heat Processing Furnaces**
- **Dry Type Transformers**
- **Constant Current Regulators**

HEVI-DUTY ELECTRIC CO.
Milwaukee 1, Wisconsin

For more information circle No. 18 on the Reader Service Card

NEW PRODUCTS AND DEVELOPMENTS

Want complete details on these announcements? Use the Reader Service Cards. You'll find them facing page 32 of this issue



TYPES DO NOT MIX WHEN FINISHED
. . . in Udylite's new cluster barrel

Main thing about the UDYLITE CORPORATION's newest barrel is: It can barrel-plate or surface-finish several different kinds of work, all at the same time, *without mixing them.*

Gentle tumbling of the work inside the barrel finishes frail parts *without damaging* them. Each small barrel gives good solution-agitation while rotating on its orbit.

By regulating the depth of the solution in the tank, barrels will drain and refill immediately with any chosen part of the solution. Any hydrogen evolved during each revolution will be expelled. Barrels are designed for the entire plating cycle.

Circle No. 205 on the Reader Service Card

LINE OF TOGGLE TYPE DIE CASTING MACHINES IN 650 TO 2000 TON SIZES
. . . features increased clearance between tie-bars

Features of this newly-produced line of toggle-type die casting machines include other things such as: faster and smoother die closing; an independent hydraulic system for the injection-end of aluminum machines; no need for flexible hydraulic fittings; and a general simplification of the circuits.

The machines are made by LAKE ERIE MACHINERY CORPORATION, in sizes which range from a clamping capacity of 650 tons to 2000 tons, and are available, optionally, with a motorized central screw-adjustment for die-height. This is said to be the largest adjusting screw in the industry. It speeds die-setup time. Large pitch diameters give support to the moving platen.

The tenpin toggle mechanism gives faster lockup and smoother operation. Standard cylinders are used and the toggle pins are located outside in order to be easily accessible.

The new, welded construction of the rear platen allows the toggle cross-head to pull back through the platen, thus shortening the overall machine length.

Circle No. 206 on the Reader Service Card

SIMPLIFIED HYDRAULIC POWDER METAL COMPACTING PRESS
. . . has 300-ton pressing capacity

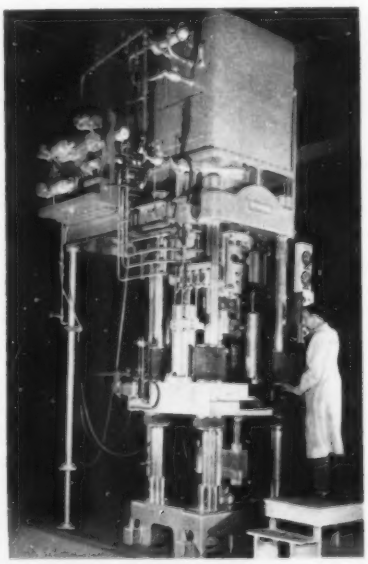
Many powder metal parts needing the high-compacting pressures of hydraulic presses, have no use for the multiple motions and complex controls found on many of these machines.

And it is for manufacturers of these powder metal parts that the F. J. STOKES CORPORATION is making its new Model 714 compacting-press series of simplified design. They are basically, single-acting presses with a single upper-punch motion.

The full pressure of the rated capacity is delivered by downward strokes of the hydraulic ram. A hydraulically supported die-table allows adjusting of resistance to the motion of the upper punch. The bottom punch extends up into the die and is fixed.

Depth-of-fill adjustment is designed so as not to interfere with the adjustment of the ejection-level. Density of the compacted part is kept uniform by varying the die-table's resistance. Metal powder is fed to the die cavity by a standard open-top shuttle-box mechanism.

Circle No. 207 on the Reader Service Card



More New Products On Page 55

You get
speedier service
from the

ZINC ZONE

Central location of
American Zinc plants assures
prompt deliveries of slab zinc to
any point in the nation.

HILLSBORO, ILL., PLANT
Prime Western, Brass Special, Intermediate, High Grade, Continuous Galvanizing Grades
MONSANTO, ILL., ELECTROLYTIC PLANT
Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
FORT SMITH, ARK., SMELTER
Prime Western, Brass Special
DUMAS, TEXAS, SMELTER
Prime Western, Brass Special, Continuous Galvanizing Grades

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

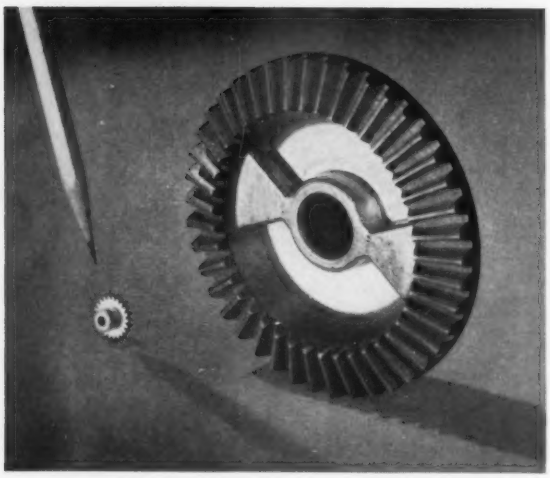
American Zinc Sales Company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY

Columbus, Ohio • Chicago • St. Louis • New York • Detroit • Pittsburgh

For more information circle No. 3 on the Reader Service Card

HOW CAN BRASS POWDER METALLURGY HELP YOU?



BY CUTTING COSTS . . . . . INSTEAD OF CUTTING PARTS

This large transmission gear for a man-carrying power mower once cost $1.56 each as a machined sand casting. Now, as a stronger, brass-infiltrated powder metal part, it costs $1.10. — **A COST SAVING OF 29%**

As a machined part, the small brass gear once cost 16¢ each. Now made as a brass powder sintering, the cost is only 6¢. — **A COST SAVING OF 62½%**

A powder metal fabricator can show you how brass powder metallurgy can help your products the same way — and with many other advantages, too.

THIS BOOKLET

will assist you in evaluating this modern production method in terms of your particular needs.

SEND FOR YOUR COPY

THE NEW JERSEY ZINC COMPANY
160 Front Street, New York 38, N. Y.

For more information circle No. 37 on the Reader Service Card

DIE MAKERS — DIE CASTERS

Standardize with D-M-E and Save!

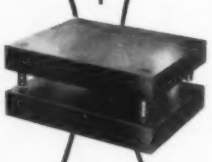
Reduce design time and cut die construction costs with these D-M-E STANDARDS--combined to fit your needs!

For added savings, start with D-M-E Standards—they're "better to begin with" because they're made of the finest steel, finish-ground flat and square. Only D-M-E Standards give you "custom-made" construction with the cost-saving benefits of standardized, interchangeable components.

RACK and PINION EJECTION

HYDRAULIC EJECTION

D-M-E Standard Cavity Retainer Sets



From 9⅞" x 8" to 23¾" x 35½"

D-M-E Standard EJECTOR BOXES up to 18" x 35½"

D-M-E Standard EJECTOR HOUSINGS up to 23¾" x 35½"

Welded Steel Construction (Patented)—30% lighter than cast-iron boxes!

Write for 170 page D-M-E Catalog, listing complete data and prices—or call or write your nearest D-M-E Branch TODAY for additional information.

58-E

DME DETROIT MOLD ENGINEERING CO.

Contact Your nearest Branch for Faster Deliveries!

- **DETROIT: 6686 E. McNichols Rd.—CHICAGO: 5901 W. Division St. HILLSIDE, N.J.: 1217 Central Ave.—LOS ANGELES: 3700 S. Main St.**
- **D-M-E CORP., CLEVELAND: 502 Brookpark Rd.—DAYTON: 558 Leo St.**
- **D-M-E of CANADA, Inc., TORONTO, ONT.: 156 Norseman Ave.**

For more information circle No. 12 on the Reader Service Card

TAP-ON FASTENER

. . . needs no threads

A new Pushnut fastener which pushes onto unthreaded rods or rivets for secure assembly is being offered by PALNUT CO. Made of heavy gauge tempered spring steel, the fasteners eliminate the need for threading, notching, drilling for cotter pins and other auxiliary operations or parts. They apply with a quick tap of a hammer.

Circle No. 229 on Reader Service Card

INCLINABLE PRESSES

. . . have rugged clutch & brake

The Torc-Pac line of open back inclinable presses, from CLEARING MACHINE CORP., DIVISION OF U.S. INDUSTRIES, INC., has some unusual design features which eliminate clutch and brake adjustments and allow millions of engagements without maintenance.

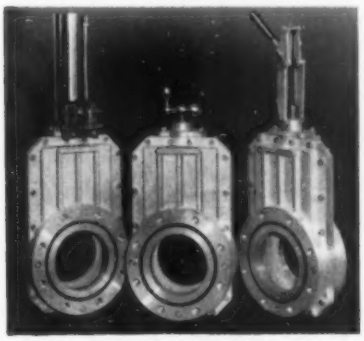
The drive unit can be removed from the press as a single unit by taking out six bolts. Four position selector switch, run, and stop buttons are standard equipment. The presses come in capacities of 22, 32, and 45 tons.

Circle No. 230 on Reader Service Card

HIGH VACUUM VALVES

. . . resist wear

New gate type high vacuum valves with full-opening design and short flow path for maximum conductance have been introduced by the VACUUM EQUIPMENT DIVISION of F. J. STOKES CORP. Special design of the valve plate seating mechanism gives a tight seal throughout the



life of the valve. Three types of actuation are offered: pneumatic, handwheel, and toggle lever.

Circle No. 227 on Reader Service Card

continued next page

Get Set NOW for the business upturn . . .

LATROBE
can give you
DIE CASTING DELIVERIES
whenever you need them!

Latrobe Die Castings of Aluminum — Zinc — Tin and Lead Alloys

As surely as night follows day the nation's economy is bound to once more push upward . . . already there are signs of improvement.

This is the time to give your die casting needs close study . . . can you be sure of prompt delivery? . . . are you fully satisfied with the quality of the castings you now use? . . . do your present castings leave something to be desired?

To make the best, then begin with the best castings by Latrobe. Our engineers will work closely with you from design to completion. Be sure of the finest quality workmanship and service. SPECIFY LATROBE DIE CASTINGS.

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E. G. Siess, Jr.
227 W. Exchange St.
Tel: Portage 2-7663

CLEVELAND, OHIO
William Kranz
19615 West Lake Road
Tel: Edison 1-6888

DAYTON, OHIO
J. M. Gallaher
363 West First St.
Tel: Baldwin 4-3523

DETROIT, MICHIGAN
J. R. Lemen, Jr.
1016 Fisher Bldg.
Tel: Trinity 3-5910

NEW ENGLAND
R. L. Thomson
79 Prospect St.
Stamford, Conn.
Tel: Fireside 8-3985

BALTIMORE, MD.
Richard R. Thum
611 So. William St.
Tel: Plaza 2-2514

BUFFALO, N. Y.
Harry W. Harding
235 Burke Drive
Tel: Amhurst 1164

Latrobe Die Casting Co.
Latrobe, Pennsylvania

Established 1918

To Make the Best—Begin with the Best Castings!

For more information circle No. 27 on the Reader Service Card

Circle No. 46 on the Reader Service Card

STROH

DIE CASTINGS

for

55 YEARS

have combined the experience of the *past* with the vision of the *future*. We are one of the oldest die casting companies in the Mid-West.

ZINC

or

ALUMINUM

We can give you precisely *what* you want *when* you want it.

INQUIRIES INVITED!

STROH DIE CASTING Co. INC.
11123 W. Burleigh St., Milwaukee 10, Wisconsin

NEW PRODUCTS—continued

SILICON PLATING RECTIFIER

. . . gives power economy

High efficiency, no aging, ability to operate in ambient temperatures of over 200°F., and high voltage rating are among advantages claimed for a new silicon plating rectifier. EQUIPMENT DIVISION, WAGNER BROTHERS INC., says the rectifier, besides requiring a lower initial investment, will save a user about one third of the costs invested in power and maintenance every 5 years.

Circle No. 231 on Reader Service Card

ROTARY INDEXING TABLE

. . . gives versatile positioning

Any number of indexes between four and twenty-four in any desired pattern can be set up on the Versi-Table, built by THE SAVAGE ENGINEERING DIV. OF THE LITHIBAR CO.

The Versi-Table is now being produced in a standard twelve inch, twenty-four station model, equipped for either air or hydraulic operation.

Circle No. 232 on Reader Service Card

PLASTIC FACE SHIELD

. . . protects against 2200°F.

Molten metal can be observed comfortably with a plastic shield developed by VACUUM EQUIPMENT DIVISION OF THE NEW YORK AIR BRAKE CO. The new shatter proof visor has a coating, applied under vacuum,

which effectively reflects 95% of the infra-red rays, and temperature between the face and visor remains at approximately 80°F.

Circle No. 228 on Reader Service Card

PICTURED ABOVE IS OUR MODERN SHOP AND OFFICES

exclusively devoted to engineering and building die casting dies and molds to exacting specifications. This plant was designed with capacities to handle and fabricate anything from a unit die insert to a 15 ton cylinder or grille die with the necessary skills and experience to save you time and money on your next tool.

RICHARD O. SCHULZ CO.

ELMWOOD PARK, ILLINOIS

●

DIE CASTING DIES • PLASTIC INJECTION AND COMPRESSION MOLDS

For more information circle No. 45 on the Reader Service Card

BARREL FINISHERS
. . . have interchangeable compartments

A wide range of finishing operations can be handled with the Model V4 and V6 Precision Barrel Finishers. Produced by RAMPE MFG. CO., the machines have 4 and 6 cu. ft. barrels with 2 or 3 interchangable compartments respectively.

Circle No. 234 on Reader Service Card

CERAMIC BOATS
. . . stop sintering contamination

Ceramic plates and boats fabricated from Sur-Braze S-2 casting ceramic, a product of DURAMIC PRODUCTS, INC., are being used for critical sintering operations on metals, ferrites, and cermets, at temperatures of 3000°F.

Circle No. 235 on Reader Service Card

VACUUM ARC FURNACE
. . . gives improved performance

An improved Heraeus vacuum arc furnace, from ROCHESTER DIV., CONSOLIDATED ELECTRODYNAMICS CORP., provides faster and more economical production of pure melts of metals and alloys with high melting points. One model will melt 40 pounds of titanium or 70 pounds of steel per charge at 1 micron pressure.

Circle No. 236 on Reader Service Card

WIRE CLOTH SINTER-TRAYS
. . . have strengthened corners

The CAMBRIDGE WIRE CLOTH COMPANY has developed a new and stronger wire cloth tray for the sintering and heat-treating of powder metal parts and other metal products. The trays are designed to prevent corner failures, a fault of most wire trays.

Circle No. 237 on Reader Service Card

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. . . use stud as its own tap

New stud driving machines built by STUDRIVE, INC., force studs into castings in timed relation to their rotation. Previous machines drove studs into precast unthreaded holes in castings by relying on a combination of interference fit and threading.

Several Studrive units may be grouped to place up to eight studs in a casting in less than a second.

Circle No. 226 on Reader Service Card

continued next page

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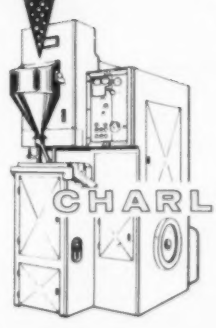

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CONVEYOR FURNACE
. . . needs no muffle

A hump-type mesh belt furnace that uses a high-purity brick for its heating chamber lining, eliminating the need for a metal muffle, has been introduced by GENERAL ELECTRIC'S INDUSTRIAL HEATING DEPT.

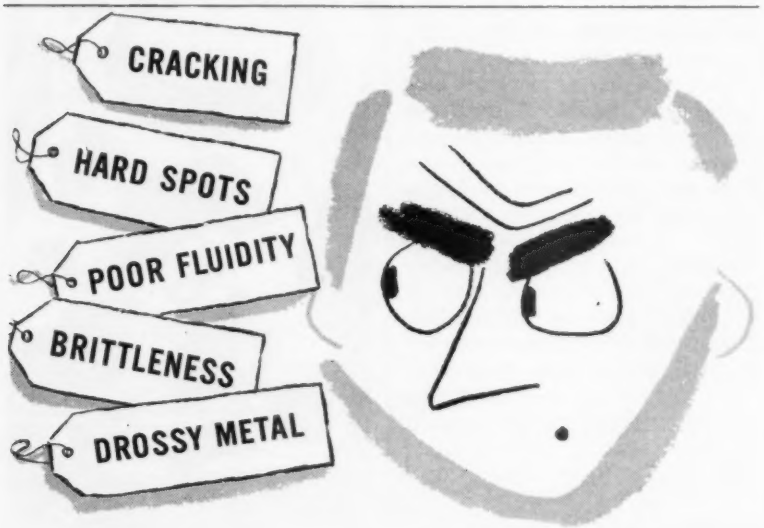
Designed for operating temperatures up to 2100°F., the new furnace is used for high production bright annealing, brazing and atmosphere quenching of stainless steels, and applications requiring a low dew point atmosphere. Belts are 12 to 36 inches wide, heating chambers up to 12 inches in height.

Circle No. 233 on Reader Service Card

CYLINDER LINE
. . . meets JIC specifications

Hydro-Line Series S2 cylinders are rated at 1000 psi hydraulic, 200 psi air, and for non-shock load up to 1500 psi hydraulic. Manufactured by HYDRO-LINE MFG. CO., the cylinders come in bore sizes from 1½″ to 8″ in many configurations.

Circle No. 214 on Reader Service Card



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For more information circle No. 17 on the Reader Service Card

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Irilac 1000, a new type of clear, protective coating for steel and non-ferrous metals, has been introduced by ALLIED RESEARCH PRODUCTS, INC. It contains effective corrosion inhibitors and can be used to replace or supplement chemical and electrolytic finishing systems. The product uses water as a solvent.

Circle No. 238 on Reader Service Card

NEW METAL PROTECTOR
. . . contains no resin or shellac

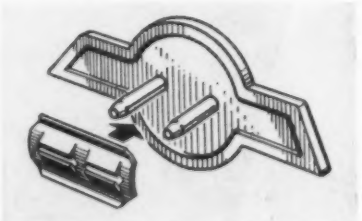
Johnson's Wax-Plate #6143 not only provides protection and lubrication but enhances the appearance of most metal surfaces. It can be applied by dipping, rolling, brushing or spraying, is easily removed by wiping with hydrocarbon solvents. Drying time is 20 to 30 minutes at room temperature. S. C. JOHNSON & SON, INC.

Circle No. 239 on Reader Service Card

NAME PLATE FASTENERS
. . . cut assembly time

A new Push-On type Speed Nut from TINNERMAN PRODUCTS, INC., provides speedy, secure fastening for product name plates, emblems, and medallions. It accepts two 3/32 inch studs with center-to-center dimensions of from ¼ to ⅝ inches.

Circle No. 224 on Reader Service Card



NEW MELTING FURNACE
. . . is motor-generator type

Induction melting furnaces manufactured by ALLIS-CHALMERS are designed for applications beyond the range of vacuum tube induction heaters.

Circle No. 218 on Reader Service Card

DIAMOND RIFFLE FILE
. . . resists high speed & temperature

Riffle files coated with 90 micron diamond particles and available in four cross-sections have been introduced by HYPREZ DIVISION, ENGIS EQUIPMENT CO. Particularly effec-

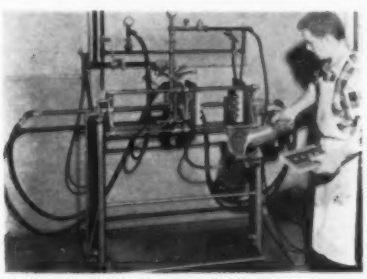
tive for die and mold making, the tools have diamond particles accurately graded and permanently bonded in chrome deposit on a hardened steel core.

Circle No. 208 on Reader Service Card

SHELL CORE MACHINE

. . . is inexpensive and complete

The 1958 model of the Dependable Shell Core Machine is prepared for operation by simply hooking up to gas and compressed air lines. The machine produces intricate small cores in four gang boxes at the rate of 10 per minute,



and cores up to 9″ diameters or 18″ lengths at the rate of one per minute. DEPENDABLE PATTERN WORKS.

Circle No. 221 on Reader Service Card

BARREL FINISHING MACHINES

. . . are quiet running

No. 30 series machines manufactured by CRANDALL ENGINEERING & MANUFACTURING, INC., feature streamlined design, extremely smooth and leakproof operation. The company claims that they can be operated with a coin balanced on top of the housing. Capacities are from 5 to 25 cu. ft.

Circle No. 212 on Reader Service Card

NUT HAS ITS OWN WASHER

. . . speeds assembly

Die cast from zinc alloy by GRIES REPRODUCER CORPORATION, new cap nuts with integral washer bases eliminate the need for separate washers. As a replacement for conventional machined cap nut and washer, the die-cast integrated unit lowers production costs in two ways: by its lower price per unit, and by simplifying assembly.

Circle No. 216 on Reader Service Card

time to re-examine

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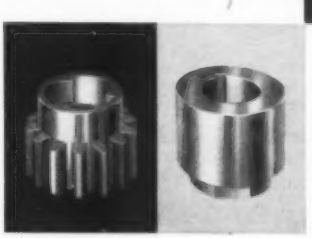

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For more information circle No. 7 on the Reader Service Card

USEFUL LITERATURE, CATALOGS, MANUALS

any of these technical publications may be obtained by circling the appropriate numbers on the Reader Service Cards, Pages 52-53

PROCESSES

Welding Titanium: 154

TITANIUM METALS CORPORATION OF AMERICA—"What's New in Titanium Welding", a quick summary of the latest techniques in resistance and fusion welding of commercially pure and alloy titanium, is the subject of a pocket-size technical bulletin recently issued.

Zinc Alloy Die Castings: 155

STELLA PRODUCTS CORP.—Photos in an information bulletin show examples of components of difficult shape zinc die cast by the company. Users from a wide range of industries are listed.

Hydrogen Data: 156

CHEMETRON CORPORATION—Hydrogen production processes, types of plants, methods of purification, and industrial applications are described in "Hydrogen", a comprehensive 36-page booklet.

Manufacturing Services: 157

DODGE PRODUCTS DIV., DODGE STEEL CO.—An 8-page booklet details complete services and facilities extending from product design engineering and development to production of finished parts, components, or products.

MATERIALS & EQUIPMENT

Simplified Die Milling: 158

ADVANCE PRODUCTS CORP.—Explanatory literature is offered on a new cross-slide rotary table to fit standard vertical mills. The device cuts set-up and machining time on complex milling jobs such as are encountered in die manufacturing.

Extrusion Die Lubricant: 159

ACHESON COLLOIDS COMPANY—The "Dag Disperser", Vol. 3, No. 1, tells how to use Aquadag colloidal graphite dispersions to increase extrusion die life and get a smoother surface finish on extruded parts.

Die Casting Machine Tests: 160

DETROIT MOLD ENGINEERING CO.—The March issue of the DME News contains Part III of "S.P.I. Injection Machinery Standards". Gives a step-by-step explanation of how to check clamping capacity and shot and plasticizing capacities by S.P.I. test methods.

Hydraulic Press Data: 161

DENISON ENGINEERING DIV., AMERICAN BRAKE SHOE CO.—8-page bulletin describes operation and uses of the 1-ton Denison Multipress for all types of metal forming and assembly operations. Includes basic specification and installation data.

Alloys Properties: 162

APEX SMELTING COMPANY—A new revised brochure covers properties of Apex aluminum, magnesium and zinc die casting alloys, including latest developments in the field.

Bearing & Bushing Guides: 163

THE BUNTING BRASS AND BRONZE CO.—Catalogs 58 and 258 make possible quick and easy selection of practically any type and size of sleeve bearings and bushings. Includes completely finished cast and sintered (plain or oil-filled) bronze components, and bars from which maintenance bearings can be cut as needed.

Die-Casting Alloys Manual: 164

FEDERATED METALS DIV., AMERICAN SMELTING AND REFINING CO.—Properties and industrial applications of the Di-Metal series of alloys are presented in a new 32-page booklet. Contains a thorough discussion of modern die casting practice, including gating and venting of dies, metal injection pressures, surface finish of dies, temperature, and important casting design factors.

Hydraulic Components: 165

DENISON ENGINEERING DIV., AMERICAN BRAKE SHOE CO.—Bulletin No. 146-E entitled, "Hydraulic Power to 5000 PSI", covers constant volume and variable volume hydraulic pumps, pumping units and hydraulic motors, 4-way valves and flow controls.

Iron Powder Data: 166

HOEGANAES SPONGE IRON CORP.—Brochure No. 112 describes Ancor MH-100 sponge iron powder. Covers chemical analysis, important basic and green properties, and presents in graph form the results of tests with plain iron, and mixes of iron-carbon, iron-copper, and iron-copper-carbon.

Environmental Test Instrumentation: 167

THE BRISTOL COMPANY—Bulletin W1831 outlines Bristol indicating, recording, programming, and controlling instruments for environmental test equipment. Covers instruments for temperature, humidity, altitude, pressure, flow, and other variables.

Heat Treating Furnaces: 168

LINDBERG ENGINEERING COMPANY—Bulletin 242 contains 22-pages of photographs and technical data on furnaces for batch and continuous hardening, carbonitriding and carburizing.

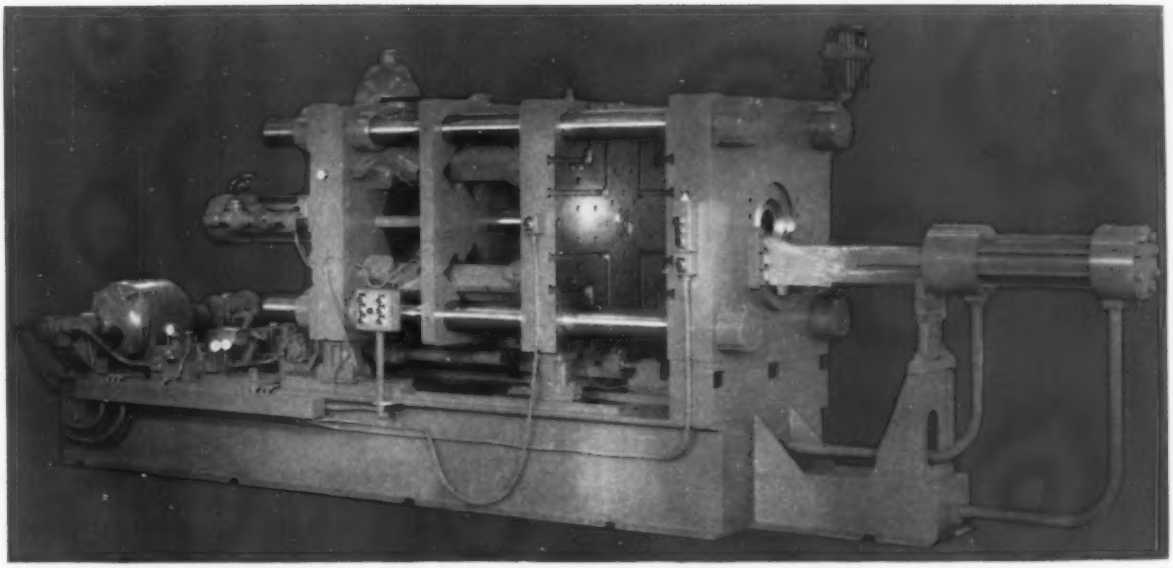
Iron Powder Melting Stock: 169

HOEGANAES SPONGE IRON CORP.—An informative new 20-page manual tells about sponge iron powder as melting stock for the steel industry. Includes an explanation of melting stock, analysis of sponge iron, carbon and carbon potential, along with the role of sponge iron in quality steel making in the acid open hearth, basic open hearth, electric arc furnace, and the high frequency furnace.

Hi-Vacuum Vapor Pumps: 170

ROCHESTER DIV., CONSOLIDATED ELECTRODYNAMICS CORP.—An informative 67-page booklet discusses equipment for both laboratory and industrial high vacuum. Explains operating principle and gives performance characteristics of various kinds of vapor pumps.

continued on page 62



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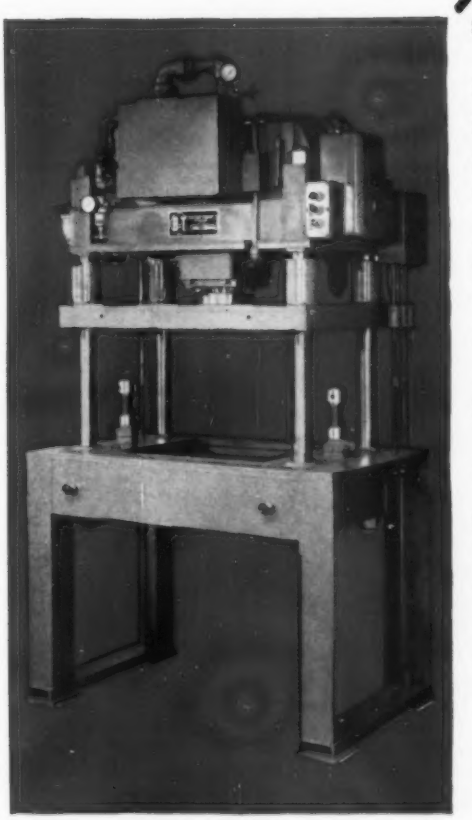

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For more information circle No. 54 on the Reader Service Card

Hydrogen Atmosphere Furnace: 171

FURNACE DIV., ECLIPSE FUEL ENGINEERING CO.—Combined full muffle furnace and ammonia dissociator is described in Bulletin D-150. The equipment was designed for bright brazing, annealing and hardening of stainless, tool and carbon steels without oxidation or discoloration.

Alloys Properties: 172

HAYNES STELLITE CO., DIV. OF UCC—Two 16-page booklets describe properties of Haynes Stellite alloy No. 21 and alloy No. 31. Both are cobalt-base, high-temperature alloys used mainly for investment castings. Booklets list chemical composition, physical and mechanical properties; charts include data on impact strength, short-time tensile strength, stress-rupture, creep, and fatigue.

Colloidal Dispersions Uses: 173

ACHESON COLLOIDS COMPANY—12-page booklet provides answers to many questions frequently asked about colloids, contains story, drawings and pictures. Back cover lists technical bulletins available on the uses of colloidal graphite and other materials.

Induction Melting Furnace: 174

DETROIT ELECTRIC FURNACE DIV., KUHLMAN ELECTRIC CO.—Brochure describes 125 KW furnace designed to melt 700 lbs. of clean copper alloy per hour. Furnace has a built-in motor driven tilting device, connects direct to a 480 V., 3 phase, 60 cycle line.

Uniform Specialty Steels: 175

CARPENTER STEEL COMPANY—How the Mel-Trol process works to insure uniform quality control in production of specialty steels is outlined in an illustrated booklet.

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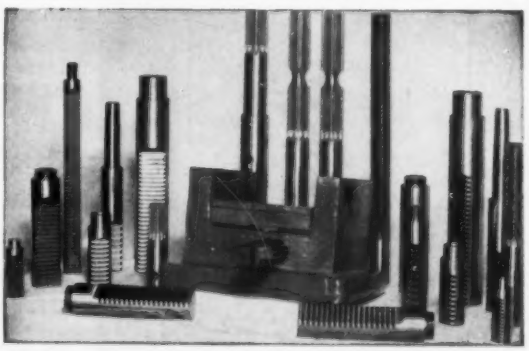

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Hydro-Pneumatic Accumulators: 176

GREER HYDRAULICS, INC.—Applications, sizes and types of a line of hydro-pneumatic bladder-type accumulators are described in Bulletin PR-200. Selection information is compiled for hydraulic circuits requiring pressure storage, primary power reduction, emergency power, pressure-volume compensation, shock absorbing, leakage compensation, transfer barriers and fluid dispensing.

Power Press Specifications: 177

JOHNSON MACHINE & PRESS CORP.—Bulletin 1958 lists specifications of a complete line of power presses. Inclinable, gap, and straight side presses in capacities from 16 to 150 tons are illustrated and described.

Cartridge Heating Units: 178

HOTWATT, INC.—A new twelve-page catalog covers a series of precision cartridge heating units and ceramic heating units. The units are offered in a full range of sizes from ¼ inch diameter up.

Flowmeter Data: 179

FISCHER & PORTER CO.—Technical Bulletin 91-119, entitled "How to Select Flowmeters", gives criteria for choosing the type of flowmeter to be used in measuring a given fluid or liquid. Advantages and limitations of basic types are listed in chart form. Major manufacturers of various types are also given.

Small Melting Furnace: 180

INTERNATIONAL FOUNDRY SUPPLY COMPANY—Booklet gives complete performance data and operating instructions for a melting furnace for small foundries. Includes explanation of melting techniques for common metals and alloys.

Furnace Tube Elements: 181

THE KANTHAL CORPORATION—Strip elements of heat resisting alloy "Kanthal A-1" allow exceptionally long tube furnace life at temperatures of 1350°C. Cheaper than platinum elements, less subject to distortion than silicon carbide rods, the strip elements are presented in an 11-page bulletin.

FINISHING

Precision Drilling Machines: 182

THE SIGOURNEY TOOL CO.—Data sheet gives specifications and features of M-100 drilling machines which were developed for critical drilling operations found in aircraft and ordnance manufacturing. Extra-heavy spindle support of the machines assures permanent alignment of table and column.

Chucks, Arbors & Accessories: 183

SUPREME PRODUCTS CORP.—General Catalog is offered which explains features of a line of chucks, arbors and a reversible speed reducer for power drills.

Finishing Catalog: 184

THE UDYLITE CORP.—The latest bi-monthly price guide on the company's products is available. The item, quantity and prices from various shipping points are shown in easy to read chart form.

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FIRST in commercial production and sale of zinc base die casting alloy ingot containing 4% aluminum made from high grade zinc. Production started October, 1924.

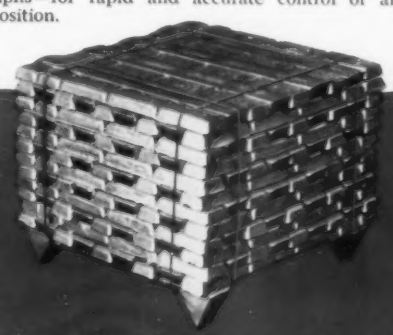
FIRST to use 99.99 plus pure zinc when it became available in 1928.

FIRST to develop the lower magnesium contents, .03 to .05%, which eliminated the hot shortness characteristics experienced with .10% magnesium and at the same time was sufficient to prevent the intercrystalline corrosion. Apex promoted in 1931 the first ASTM specification written for zinc base die casting alloys.

FIRST to establish and publish information on the effects of metal and die temperatures on different alloy compositions through actual die casting of thousands of test bars. Apex "Metalgrams" showing these effects were initiated in 1931 and continued through 1945.

FIRST to use large capacity refractory lined furnaces for alloying, replacing the conventional iron metal pots. The larger heats established a uniformity of composition not previously attainable. Iron pickup also was eliminated.

FIRST to employ Quantometers—direct reading spectrographs—for rapid and accurate control of alloy composition.



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